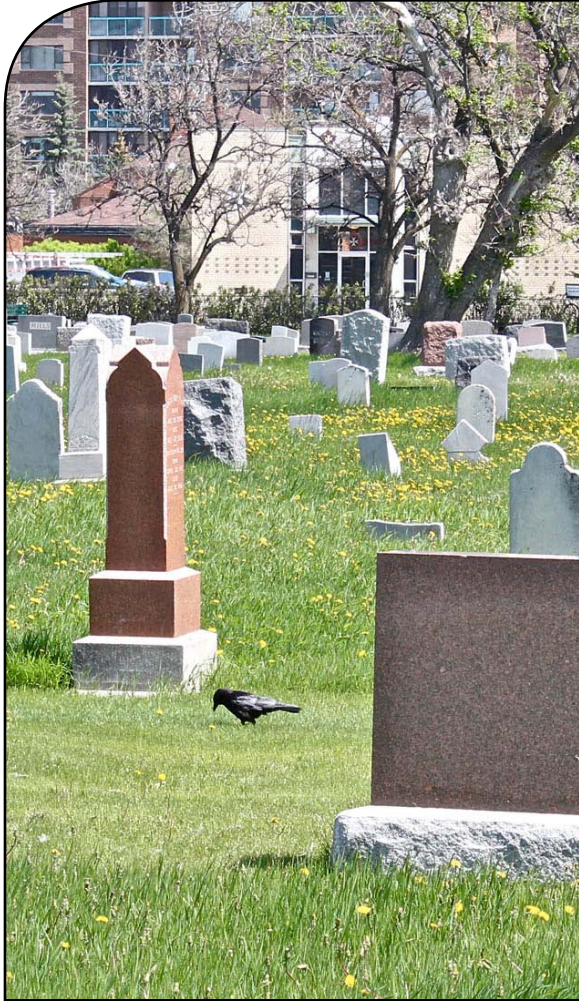


Feeding Habits



An American Crow feeding near its nest in a sustainable habitat in **Winnipeg**, Manitoba. When it found an 8 cm long piece of discarded bagel, it hid the surplus food in longer grass and covered it with some nearby pieces of dry mowed grass. I uncovered the stored food and recorded its location

American Crows store surplus food year round



FEEDING HABITS

9

A thin layer of topsoil sustains us. We farm it each day with huge tractors and by hand. We are food gatherers; it is our place.

Enter the crow. Evolution favors diversity; not morality. The courageous crow likes what we do on this gravity-held sphere. Perched atop a bare tree, it watches as we transform the landscape into agricultural and urban vistas. Then, with a smile, she plunges right in. When other species became destitute and weak, the crow absorbs the slack left in their wake. The omnivorous crow enjoys a superb feast of plants and animals. Therein lies our problem with this creature. Our categorization of Nature into good and evil stumbles over her black body. For over a century the crow has been in our gunsights. We kick it out of the way, only to have it bounce back and re-enter the picture. That is not right; we are the dominant species – the credit card users, the art makers, the software writers. A bird competes against us

and sometimes it wins. It has the audacity to eat some of our crops, and our self-defined “pretty” songbirds. Then it dines with relish on what we discard as waste. Does this bird have no limits?

American studies

Even the blackest of them all, the crow,
Renders good service as your man-at-arms,
Crushing the beetle in his coat of mail,
And crying havoc on the slug and snail.

– HW Longfellow 1863 (online)

From the agricultural sector complaints about the crow became louder and more numerous. Something had to be done. Something was done. The feeding habits of the American Crow were investigated and are still being looked at to this day, although not with the vigor or intent in past decades. Today, we accept the crow as a useful, necessary part of the landscape.

The perceived feeding habits of the crow were revealed along many fronts. In the late 1800s, at the World’s Fair in **Chicago**, the zoological science exhibits attracted many viewers. The largest number of specimens on exhibition were birds. “The **Manitoba** exhibit is placed in the Manitoba building outside the Fair grounds. It contains a large number of birds mounted on trees, but without labels.”

The exhibit of the Division of Economic Ornithology and Mammalogy was unequalled. Divided into two sections – one was economic



Even though American Crows appear the same to our eyes, each crow has a different personality, a preference for certain foods, a status, a perfection of intelligence, and a sense of humor





American Crow gathering food in a lawn for its 4 nestlings in **Winnipeg**



(the food of birds); the other faunal (geographical distribution). Some mounted birds were positioned in their natural surroundings – a Robin worm-hunting on a patch of lawn; Kingbirds devouring bees, and Crows in a field of freshly sprouted corn c60.

An early picture of the American Crow's activity in the **United States** revealed the tendency of this bird to adapt to habitats redesigned by humans. Wherever natives or invading Europeans set up camp and removed trees to make their agriculture possible, the crow flourished. Where the forests were extensive, the Common Raven was the corvid most often encountered. As the forests were cut, then self-regenerated, so to did the corvid species, to match the changing habitat 903. Now that agriculture has consumed the best patches of soil in North America, the crow follows us to where we hang our hat; or @, as my webmaster likes to say. Ravens have learned to nest on man-made structures in our northern cities; crows prefer the upper branches of tall trees, native or exotic, deciduous or coniferous.

Crops, crows, and insects

People were hired; crows were killed. The earliest report in the 1890s on the feeding habits of American Crows came from the **United States** Department of Agriculture (USDA). Crows' stomachs, 909 of them, were collected in the eastern half of the country. Their contents

were analyzed. The findings came as no surprise to anyone who closely watches the seasonal feeding habits of this wondrous bird. The two authors, Barrows and Schwarz, declared the crow a useful animal to have around. Farmers and the economy profited by its insectivorous ways. Of the crow's annual intake, 26% by volume was insects; mostly grasshoppers, May Beetles, cutworms and other destructive invertebrates. Crows' stomachs (gizzards) were often replete with insects. To balance this good behavior, the crow's annual intake of corn was 25% by volume. But less than half of this was the soft sprouted, or milk-stage corn. Throughout most months, it was the grain spilled or left in autumn fields that was consumed b38. A recent report (1980s) from **Illinois** indicated the



Some of the early farmers in North America complained about the feeding habits of the American Crows. It is part of our wild-life heritage, © David Scott, 2012, with permission





Short-horned Grasshopper on finger, © by Dr Bruce G Marcot, SW Oregon, with permission

amount of field corn left on the surface as waste after the fall harvest amounted to 420 kg per hectare prior to ploughing, and 10 kg per ha after the plough had passed w26.

The above figures meant little or even annoyed landowners who saw their livelihood partially reduced by the American Crow. Once that happened, almost nothing the bird did by way of redemption altered the attitude of a farmer. Such was the feeling of Dr. McKenzie of **Missouri**. A respondent to a questionnaire sent to landowners as part of the Barrows and Schwarz survey, he related how crows attacked the corn, forcing him to replant three times. I wonder which crows (birds) he was talking about, or how many hectares of corn he replanted. On the shiny side of the black feather, George Coleman, in London **Nebraska**, praised the crow for its activity against mice and insects. Almost a century later in the mid-1980s, a force of grasshoppers caused hardships to grain growers. At such times, magpies, gulls and crows fed with quiet, ordinary dedication on these insects.

Since invertebrates (mostly insects) are important food items for many birds, including corvids, a breakdown of their nutrient worth is necessary. Over two summers (1989–'90), sweepnet samples were taken in two fields at the Flint Hills region in eastern **Kansas**. The invertebrates were collected along random transects at 2-week intervals. They were sorted into taxonomic groups, dried at 70 °C for 48 hours, and weighed. In 1990, Acrididae (Short-horned Grasshoppers)

formed 40–56% of the total biomass at the two sites. The combined analyses for 12 groups of the invertebrates as percentages of dry mass –

- (1) Fat 7–32%
- (2) Crude protein 54–77%
- (3) Ash 3–7%
- (4) Crude fiber 5–17%

For 10 of the insect groups, the combined levels of two elements were –

- (1) Calcium 1292–2560 ppm
- (2) Phosphorous 5840–9360 ppm

The gross energy contents of the 17 taxonomic invertebrate groups ranged from 4,906–6,452 calories per gram (dry mass).

Nutrients in a crow's food can have an impact on nesting success and reproductive output. Eventually, we must ask if fragmentation of habitats will change the species composition of invertebrates birds consume? Will the patchiness of the remaining invertebrates be of a high or low quality, and will that mask the impact of vegetative fragmentation? r81

A feeding survey in a 1920s report on the crow were submitted to the **Pittsburgh** meeting of The American Ornithologists' Union (AOU) by Charles Shoffner, associate editor of the *Farm Journal* out of **Philadelphia**. From a questionnaire he mailed to farmers across the USA came 9,731 replies. The most usable were replies based on personal observation or *opinion*. In favor of the crow 1,801; against the blackshirts 7,829, with 101 apparently neutral (not reported). Of those against the crow –

- 7,573 damage to crops
- 6,937 to poultry
- 4,112 to young pigs, sheep, rabbits, etc
- 6,796 to song birds
- 6,493 to game birds

Mr Shoffner indicated the survey probably encouraged farmers that had been wronged by the crow to strongly voice their opinion, while farmers unconcerned about this bird, may not have responded. What was remarkable was the high





number of people who defended the blackshirts. Four recommendations were listed, which the AOU members thought justified. I shall skip the four. With today's knowledge and farming practices, the four don't matter now a52.

■ n some areas, common sense and sound observation prevailed. The feeding habits (1920s) of the crow in **Massachusetts** were considered beneficial. "Unless the birds become unduly numerous, they are likely to be of great service to the farmer" f56.

But crow only peered.

Then took a step or two forward.
Grabbed this creature by the slackskin nape,
Beat the hell out of it, and ate it.

– Ted Hughes 1971

Returning to the 1895 report by Barrows and Schwarz, they mentioned the bounty system. They received a letter in 1890 from Robert Alexander of Wayne County **Michigan**. He told of a 10¢ a head bounty on woodchucks, crows and hawks that lasted four years. Although about \$100 was paid out, the crows appeared to be more abundant.

To conclude their report to the Department of Agriculture, the two men agreed – "It seems probable that in most places the Crow is neither so harmful nor so valuable as to render special laws necessary for its destruction or protection, but from a purely economic standpoint the attempt to rid a State of Crows by bounties or any other means must prove either a complete failure or a most expensive success" b38.

Early in the 1900s, the USDA continued to fund feeding studies on the American Crow. This time, in a broader, more comprehensive assessment, ER Kalmbach, a biologist and a man skilled enough to create a lively painting of a crow for the cover of his report, examined 2,118 stomachs of crows from 40 states and some Canadian provinces. A general breakdown of his findings on an annual basis by volume consumed gave –



Crows and other birds consume thousands of kilograms of grain corn left on the ground after the fall harvest in southwestern **Ontario**. A shallow snowfall and mild weather encourage crows to form large roosts each winter

Adult crows	vegetable food 72%
(n 1,340)	animal food 28%
	(insects 19%)

Nestlings	vegetable food 17%
(n 778)	animal food 83%
	(insects 48%)

Reflecting on his work, Kalmbach realized that the 650 different items in the diet of the crow made it very difficult to establish the crow's worth because much depended on seasonal circumstances. He lightly castigated the rural entrepreneurs who refused to acknowledge some of the benefits the crow can provide for them k06. In his most important publication in 1934, Kalmbach explained how to interpret the remains of food found in the gizzards of birds, including the American Crow k09. Feathers, eggs shells, and grain in a gizzard were open to interpretation. Did the egg shells come from an active bird's nest or an addled egg? I can add, did the crow find an egg on the ground, which it then consumed, or did the





crow eat eggs from a nest partially destroyed by another animal?

The above studies encompassed large areas, such as the eastern half of the United States. With so vigorous an undertaking, an even flow of crows' gizzards for analysis throughout a year was difficult to achieve. A different approach was tried. A new study was restricted to an area around Ithaca **New York**. Radiating over five counties, 465 crows were collected throughout the year and their stomachs' contents examined.



For optimum results, use a tony scarecrow

Their feeding habits held no surprises –

- (1) plants 62%
- (2) animals (mostly insects and mice) 19%
- (3) minerals, etc. 19% (added for completion)

Of plants consumed by crows, buckwheat made up 19% and corn 14%, and the bulk of the grain (leftovers) was eaten over the winter months. Both grains were widely cultivated. He found corn, when it is sown in May, accounted for only 1% of the contents of 30 stomachs. [It is possible some of this corn was accidentally spilled when a farmer was filling the planter, and then eaten by a crow.] Corn was absent in gizzards in August, but returned a month or two later. Oats, wheat and barley were also found in small amounts. In May, 90% of the 30 gizzards contained adult beetles and 23% of the 30 contained only those beetles. Grasshoppers made up 11% of the annual diet and were taken from July–October. Cultivated cherries were in 5% of gizzards over the summer, but where the fruit came from was not known. Deserted orchards were available. Overall, wild fruit made up 10% of the annual diet of the crow. There was no evidence of egg or nestling consumption. Garbage, including egg shells eaten in February, amounted to 2.5% of the annual diet. **The judgement was in favor of the American Crow**, because it helped to control May-beetles, grasshoppers and rodents h81.

In a list of birds that consumed seven injurious insects, the American Crow fed on three of them – False wireworms, *Eleodes* spp; beetles, *Chrysobothris* spp; and white-grubs, *Phyllophaga* spp; the latter taken from under the ground m70. Crows probed into lawns with their bills to search for grubs f53. Crane flies (Tipulidae) were eaten by several species of birds including the American Crow. Pentatomid (stink bugs) were a particular favorite of crows m68. The American Crow also fed on the Green June Beetle, *Cotinis nitida*, (its larvae are destructive to grass) m71. Crows ate grasshoppers, cattle grubs and heel flies (genus *Hypoderma*), the latter when their larvae emerged from the backs of cattle and dropped to the ground m73. The Mormon Cricket, *Anabrus simplex*, destroyed range and forage crops in several counties in **Nevada**. Almost 40





bird species fed on this cricket, one of which was the American Crow [21].

Crows and cornfields are a generous mix during the breeding season in **Iowa** and **Illinois**. In the early to mid-stages of corn growing, two, fix-width transects, one in the middle and one along the perimeter of corn fields, were sampled 3 times a week. Bird counts in the morning, from 6 May–9 July 1986, detected 53 species. The crow,



Crow at the edge of a duck pond while looking for food on a lawn in September 2010

along with 17 other species, was placed in the occasional column, behind birds in the regular and resident columns. The authors, like many others, actually believed the crow should have been more abundant because it was listed as a lover of corn in May and June in earlier field studies. To explain the lack of crows in their study, they wrongly suggested the crow was too wary to be included in their counts [3b]. By the end of June, corn plants in Illinois were up to 85 cm tall, and 30–50 cm tall in Iowa. At these plant heights, crows do not land and feed in a cornfield, since the bird's visibility is restricted. Crows prefer to feed in open, harvested corn fields during the fall and winter.

On the web, I located articles on early corn planting techniques. First there was the dibble stick for planting small plots of corn for family use. In the 1860s the first mechanical corn planters were invented. Usually a horse-drawn machine cut a groove in the soil and children of the farmer dropped corn seed into the shallow trench and quickly covered it with loose soil. This procedure may have resulted in some corn sprouting near the surface which made the young shoots and kernels available for a small number of crows. In 1900, corn farming in **Iowa** relied on a two-row planter pulled by a pair of horses. Today modern tractors can handle 20 or more row planters. Each row of corn in 1900 was 42 inches (1.06 m) apart compared to 30 inches (.76 m) today. Back then, about 3 seeds every 40 inches of row was the standard density of corn plants. Then, as now, I assumed the seed was planted 1–2 inches (3–5 cm) below ground at an appropriate soil temperature.

From this **Iowa** State University corn planting guide on the web, the average yield of corn was 38 bushels per acre (per 0.4 hectares) in the Edwardian era (1901–1910). In the 1970s, the average yield was 100 bushels per acre; in 1994, 152 bushels (the highest recorded from 1900–2000). The acreage planted has risen from 9,000 to 12,000 in the state. With little change in weather, the optimum time for planting corn in Iowa still falls between 20 April and 5 May. Planting after 15 May causes a drop in yield. Corn should be planted once the soil temperature at planting depth is near 50 °F (10 °C) or above. The time to emergence of leaves ranges from more





than three weeks at a 50–55 °F soil temperature, to less than one week with a soil temperature greater than 70 °F (21 °C). Grain corn populations of from 28,000 to 32,000 plants per acre (0.4 ha) are used today in **Iowa**. Recommendations for silage corn production are 2,000 to 4,000 plants per acre higher than for grain corn.

From the above planting dates, leaves of corn will start to emerge in mid-May, when crows were feeding rather large nestlings that might enjoy a kernel of soft sprouting corn, if they can obtain it. At nesting time, crows are in small family units of 2–5, and widely dispersed over farmland. Near Saskatoon **Saskatchewan**, in 1987 and 1988, a pair of nesting crows occupied from 0.4–0.80 km² (40–80 ha) in treed parkland ⁱ⁰⁴. Around Ithaca **New York**, crows required a territory of 38 ha (13–95 ha) in the country for nesting ^{m85}. How such widely spaced small families of crows can do great damage to a sprouting field of corn is difficult to understand.

One for the blackbird, two for the crow;
One for the cutworm and two to grow

– Early corn-planting rhyme

■ did a little corn growing in the spring of 2012. Along the sunny north bank of the Assiniboine River, a fresh 15 cm deep layer of silt was deposited from flood water the previous year. In mid-May I planted a dozen kernels of sweet corn 3 cm below ground in the fine sandy soil. In full sunlight, the corn sprouted, and by 30 May several plants were 3–4 cm tall. I grasped one of the sprouts at ground level with two fingers and tried to pull it out, just as a crow might with its bill. To my surprise, the stalk broke off at ground level, leaving the kernel buried. I tried another sprout, and was again surprised. I dug up a third plant to have a look at the kernel. It appeared intact, but its several centimeter long root system secured the kernel firmly under the ground. Unless crows made an effort to dig up each underground kernel with their bills, I don't see how they could have done much damage to sprouting corn. By the 6th of June, my plants were at the 4-leaf stage (about 14 cm tall). When dug up, the roots were longer and fuller than before, and the kernel was of normal size, about 1 x1 cm, but soft and probably drained of its nutrients.



The 2 young corn shoots on the left broke off at ground level when I tried to pull them out with my fingers. The kernel of corn (arrow) remained below ground, securely kept in place by its long root, even at this early, 2-leaf stage of growth. Perhaps the crows dig the 3–5 cm deep kernels out with their bills. This seems like a lot of work for one kernel, let alone hundreds of kernels each week to feed older nestlings. Insects and mice are easier to obtain and more nutritious

In Marshall County **Iowa**, bird abundance and nesting success were compared for 3 years on eight, 16 ha (40 acre) plots in corn and soybeans, to 8 plots in Conservation Reserve Program (CRP) fields planted to Smooth Brome, Orchard Grass and Alfalfa.

Bird census counts were made on 20 May and 10 July on all 16 plots. From the 33 and 34 bird species seen and heard in the CRP and crop fields, the total mean abundance was 315 birds per census





A pair of successfully breeding American Crows, without a helper, fed in late May 2011 in the open for worms, insects, mice and spiders in the lawn of a cloverleaf section of highway less than 100 m from their nest in a Colorado Spruce in **Winnipeg**. Lawns are a favorite feeding habitat

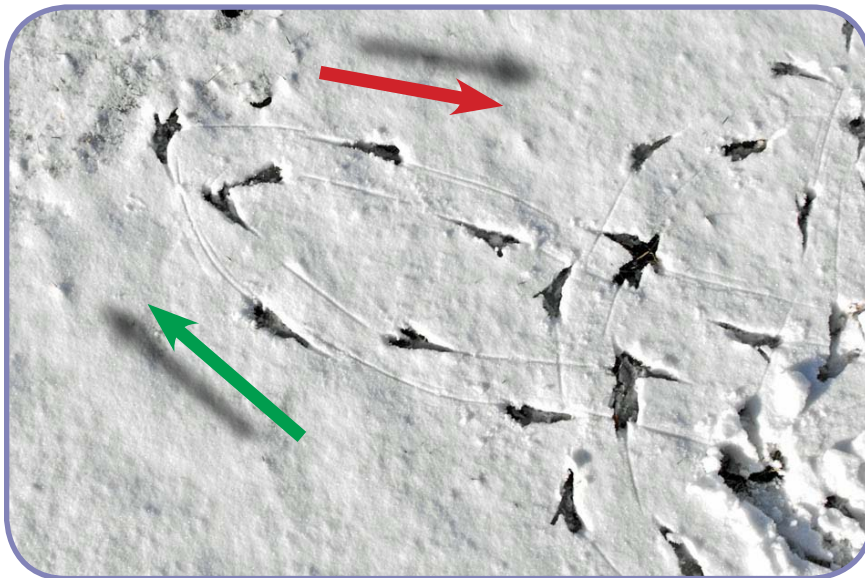
count per 100 ha in CRP fields, and 84 birds in row crops. Average abundance for American Crows was only 0.4 in CRP grassy fields and 1.9 in row crops. Crows didn't nest in either habitat p21.

In **Illinois**, 718 gizzards and 1,214 regurgitated pellets were examined, the latter from 12 crow roosts over two winters in 1937–'39. Analyzing nine different collections of each on a volume

basis, **waste corn** was the crow's staple winter food (93% from stomachs and 95% from pellets). Other plant seeds occupied less than 4% by volume – Smooth Sumac, Poison Ivy, Hemp, Giant Ragweed, and tubers of Chufa and Linden. There were a surprisingly large number of bone fragments from mice and shrews, along with some carrion (up to 3%). Although the fragments were quite small and broken, they appeared to be mice,

Microtus and *Peromyscus*, and two shrews *Blarina brevicauda* and *Cryptotis parva*. Over the summer months, insects occupied a greater share of food resources. Gizzards from 18 crows held 62% corn and 13% insects. Gizzards of 6 nestlings held 58% insects and 7% corn 20b.

As part of a study of home ranges of crows in **Illinois**, it was found that in agricultural settings, crows usually fed in fields recently tilled (invertebrates and mice) or recently harvested (waste grain). In an urban setting crows fed at dump-



A feeding crow changed its mind and made a 180° turn in shallow snow covering a lawn in **Winnipeg**





Three juveniles on 28 June 2011 in a park. When an adult approached or called nearby, the hungriest juvenile responded with an open pink mouth and flapping wings. The eyes were still bluish gray and a streak of pink remained at the base of the bill below the eyes

sters, picnic areas and on parking lots for discarded food y11.

The numerical method is also used to determine the economic importance of a wild bird's food. Like the volumetric method, it has limitations and errors. For example, insects with resistant parts were over represented among the items counted in avian gizzards. Some meals remained hidden from researchers. For instance, a bird may peck into a ripe grape, enjoy the juice, and fly off. No record of eating the juice of the grape appeared in its gizzard. Therefore, gizzards should be examined throughout the year, even at different times of a day, to get a fuller idea of what a crow was eating and when. If an examination of 100 crows' gizzards produced 675 kernels of corn, what did that mean? If we said 15% of the crow's diet was corn, the farmer knew what level of damage she might expect from crows in her area. She also knew crows ate other things beside corn m69. When corn is eaten over the winter after the harvest, this may aid the farmer. If her crop rotation schedule called for soybeans to be planted the next year, there would be fewer rogue corn plants (weeds) to contend with at harvest time, thanks to crows that fed in her corn fields.

The best reporting system on food consumed

was a combination of the numerical and volumetric methods. Individual food items were counted as much as possible, then used to determine the proportions of important food items as percentage-by-bulk. "The few good points peculiar to the numerical system can profitably be combined with the volumetric method" m69.

Although the native American Crow is attacked by many foolish people, introduced birds may also cause some people to become nearly demented. Such was the case with the introduced English Sparrow, which arrived in Brooklyn in 1852. In the 1880s, the Right Honorable Warner Miller tried to appease both farmers and bird lovers in the United States with this bullshit –

The indications are that if the English Sparrow is allowed to go unchecked it will not be long before the annual loss of grain and fruit products due to his ravages will be in amount sufficient to pay the interest on our national debt, if not the debt itself. Few persons have any conception of the scourge he has proved wherever he has been naturalized in foreign lands, and he threatens to become a greater pest to the American farmer and horticulturist than the grasshopper, caterpillar, and Colorado beetle 23m.





Juvenile crow feeding on ripe fruit of Red-osier Dogwood in **Winnipeg**. Two white, 1-stoned drupes, 5 mm wide are in the tip of its bill; a cluster of white fruit is nearby (white arrow), 25 August 2011

From 1636–1736 along the eastern USA, crop damage by the Passenger Pigeon, *Ectopistes migratorius*, American Crow, *Corvus brachyrhynchos*, Red-winged Blackbird, *Agelaius phoeniceus*, and Common Grackles, *Quiscalus quiscula*, was a serious problem for colonial farmers. 09c

In the 1940s, crows around the Baton Rouge area of **Louisiana** continued to be studied. Birds were shot from January to May, and 135 gizzards examined. Comparing autumn and spring, plant



Spiders are fed to nestlings, or eaten by the adult crows. This may be a wolf spider

food utilization dropped from 77 to 47% by volume, while animal food (mostly insects) increased from 19 to 53%. Over the autumn and winter, important foods by volume (about 66%) were Rough-leaved Dogwood, pecans, Poison Ivy and acorns. In spring, Blackberry and Red Mulberry together made up 27% of the crow's diet. The spreading of Poison Ivy by seed dispersal through regurgitation of pellets is a possibility. Corn ranked low, appearing as 7% on the winter menu, and a trace the rest of the year. Corn, however, was not a common crop in this area of Louisiana. Among insects consumed, cicadas were a favorite, partly due to a peak year for the emergence of adults in 1949. During winter, when insects were not as abundant, crayfish became a part of the crow's diet. 132

In the 1970s, contents were identified from 690 gizzards of crows. The birds came from the enormous Fort Cobb winter roost in **Oklahoma**. Early in the season, waste peanuts were preferred – 81% by frequency and 40% by volume. Other seeds, chiefly corn, Hackberry, Wild Peas, and Wild Lespedeza occurred with a combined frequency of 86%, and volume of 12%. After mid-December, when the peanut supply was ex-





Thankfully, House Sparrows are fed by a few caring people. The small scattered gangs of sparrows provide a wonderful avian contact over the winter. Their lively chirping and eye-catching movements in the shrubbery soften and enliven our sterile cities in the north

hausted, crows usually shifted their emphasis to leftovers on the ground in corn fields i01.

In southwestern **Oklahoma** during the 1930s, a small comparative survey of stomach contents matched 14 crows with 17 White-necked Ravens, *Corvus cryptoleucus*. For 14 crows, the volume of grain sorghum and corn accounted for half of their food. When melon, citron, and sunflower seeds were included, the total rose to 85% of their diet. Beetles and grasshoppers added another 14%, and mammals the remaining 1%. Much of the consumed grain came from fields after the harvest i09.

In the 1980s in **New Jersey**, 2,354 of 3,462 (68%) of crows fed in corn, wheat, soybean and grassland fields, with shifts in feeding habits depending on the year, food abundance, and availability m04.

An online, 83-page report (2006) by the United States Department of Agriculture and their **Nevada** counterpart revealed avian damage to agriculture in Nevada by 7 species. For the fiscal year, the total was about \$72,000. The largest category was the livestock industry where \$43,000 damage was done by the combined efforts of starlings, blackbirds (2 or 3 species), and feral pigeons. In the list of 7 categories, only in feedlots did the starlings eat in a selective manner from the grain set out for cattle. Crows were not observed in feedlots, in spite of the abundant use of corn to finish the cattle before they were slaughtered. The Human Health and Safety category included the crow, for a total cost of zero.



The overwintering fruit (drupe) of poison-ivy is one of hundreds of food items that provide nourishment for crows





When young Leopard Frogs are plentiful in the autumn, snakes, mammals and birds dine out quite often

Crows in Kansas

Moving into the plains area of south-central **Kansas**, DR Platt collected 617 regurgitated pellets from roosts and lookout posts year round from 1952-'54. Reno and Harvey Counties were the outdoor theatres. Regurgitated pellets were far from a perfect reflection of what the crows ate or how much of any one food type or item. When Platt raised a crow on soft food, it did not regurgitate pellets p69.

A nesting population of about one family per 259 ha was enhanced by an influx of northern migrants in the fall that reached as high as 180 birds on 259 hectares (1 sq mile). Wheat and sorghum were important grains in **Kansas**. From late July to early September, crows fed in ploughed and stubble fields, pastures and newly mowed hay fields, but few pellets were obtained at a roost of hundreds of crows. The milk stage of corn was available in early August, but corn was not found in regurgitated pellets. Grasshoppers and beetles were a common component in the crow's diet, along with fish, crayfish, and snails. Most of the winter wheat was sown from 5-15 October, but the fruit did not appear in pellets. Ants were often eaten in early autumn. In the winter of 1953, grain

sorghum, and sunflower seeds were the two main foods of crows in the two counties in Kansas.

Most of the feeding was in harvested grain fields, along with ploughed alfalfa and pasture fields. In February newly sown fields of oats were probably a source of this grain in their pellets p69.

Overall, the yearly averages below were from 18 separate samples in **Kansas**. Some crows were collected in pairs from the two counties. Plant material amounted to 69% of the undigested pellet residue. The top 7 items were –

- | | |
|---------------------|-------------------|
| (1) wheat 23% | (5) oats 8% |
| (2) sorghum 15% | (6) sunflowers 7% |
| (3) beetles 13% | (7) corn 5% |
| (4) grasshoppers 9% | |

Wheat was the main food of crows in June and the latter parts of July, after the harvest. To flesh out these thin statistics, Platt noted some damage to sorghum before it was harvested in the autumn, but most of the fruit was taken as waste grain over the winter. In spring, crows took advantage of newly sown oats, but the damage was minimal. There were no damage reports against crows from wheat farmers, and no pulling of sprouting wheat was found. Damage to sunflower seeds





was slight. Wheat and corn were also gleaned from what was left behind in the fields. Local damage to watermelon could be important. When corn was sprouting, few crows were about, so the damage was minimal. No complaints were voiced by a handful of corn farmers in this part of Kansas p69.

during the summer beetles peaked at 49% in the crow's diet during the latter part of July, falling to 3% by December. In late June, Scarabaeid beetles made up 29% of the crow's diet in **Kansas**.



The handsome European Starling, an aggressive flocking bird, was introduced into North America in the late 1800s. It feeds in crops and lawns



In mid-May a crow is foraging along a curb in **Winnipeg**. On its territory year-round, this crow may never see a corn plant in its life

These beetles are destructive to wheat and alfalfa. White grubs are the larvae of scarabs. Grubs commonly attack the roots of turf and ornamental plants. Finally, crows do their best work when they dampened the explosive nature of injurious populations of grasshoppers that eat the foliage of corn, wheat and alfalfa. Eggshells in pellets were probably due to crows feeding on chicken eggs in dumping grounds. Farmers on poultry farms did not report eggs lost to crows, since chickens were kept indoors to enhance production.

In conclusion, Platt thought crows did some damage to the ripening sorghum panicles in **Kansas**. In the United States, sorghum is used mainly as feed for livestock. Its nutritional value is similar to corn, although it has more protein and fat, but less vitamin A. Damage to sprouting oats in late winter and early spring was slight. p69.

Protection for orchards and crops

American Crows sometimes feed mightily on crops, unconcerned about the prayers and actions of farmers. Such destructive, isolated instances were often overlooked by general food studies.

In **Oklahoma** the damage by crows to the state's crops in 1918 was about \$1.5 million, chiefly from grain losses during the winter s17.





Grasshoppers in late summer are a common, abundant food for crows

Crows fed in pecan orchards. To retaliate, the locals dynamited crow roosts and blew some of the blackshirts to bits in the winterⁿ²². A band of crows in Oklahoma caused about \$1,000 damage to a pecan grove. General shooting practices disrupted the crows' feeding patterns and the crop was saved^{12h}.

In the Goodnoe Hills of Klickitat County in **Washington**, 30,000 crows fed in the almond and apricot orchards. Flocks of crows arrived in late August as the fruit in orchards was ripening. A 20-acre orchard held 1,500 trees. From 10–30 crows landed in a fruit tree. In the 1920s the destruction of the \$800 crop took two days. The crows then moved to another orchard. In the hot afternoons, crows visited fields of watermelons and poked their bills into most of the ripe and green melons to quench their thirst. After several days, a solution was found. Almonds were carefully laced with strychnine, so they showed no tampering. The largest nuts were scattered below trees where the crows usually fed after knocking almonds to the ground. It took only a few crows having convulsions and dying from eating the poisoned almonds to spread fear throughout the flocks.

The crows' feeding habits quickly changed. Adding poison to some almonds killed less than 300 crows and the remaining birds left the area⁹⁰⁶.

In almond orchards in **California**, crows were an economic pest at times. Shooting was a suitable scare tactic in conjunction with other dispersal methods. At the Davis farm in California in the 1930s, crows knocked almonds from trees and then ate the fruit on the ground. They soon learned to eat the best varieties of almonds. One campus orchard was relieved of 28% of the potential crop by the start of September. Contacts with local commercial orchards indicated light to negligible damage by crows^{e37}. In California several birds caused damage to pistachio orchards. In 1984 the total crop loss was about \$1.8 million. By then, poisoning, trapping, and killing crows were not suitable methods of population reduction. Controlling the hungry birds included shooting (scaring) along with audio and visual repellents. Growers felt these methods were slightly to moderately useful against the birds. A study at three orchards, with a history of damage by birds, showed Scrub-jays damaged from 58–99% of the fruited trees in a random pattern throughout the orchards. In three other orchards, damage to the



Wherever we go, American Crows follow, watch and learn from us





A family of American Crows feeding in Assiniboine Park on food left by people; Their nest was 80 m from a pond that hosted ducklings from several successful nests, 19 August 2011 in **Winnipeg**

fruit by American Crows ranged from 18–46%, but their damage was in a clustered pattern. These feeding patterns were used to determine suitable sampling techniques to assess damage by each species of bird 30c.

broadcasting a nestling's distress call and the call of a dying adult American Crow proved to be an effective deterrent when started early in the season. But the calls had to be changed quite often. A field protocol was presented that involved supplementing the generated sound with pyrotechnics, gas cannons and shooting (scaring) for maximum effectiveness. The broadcast units ran until the harvest. With the sound units in place, damage at two almond orchards dropped from 6 to 1 kg / ha, and from 18 to 5 kg / ha. However, the shifting of feeding crows from one orchard to another orchard due to the scare tactics was not mentioned 30h.

Here is an instance where American Crows became a nuisance to farmers of apple orchards on the plateau known as the **Missouri Ozarks**. The Coddling Moth, *Cydia pomonella*, is a long-standing pest of apple growers. In the 1920s, this moth reached serious numbers. Woodpeckers

and bluebirds provided some control. The growers also wrapped paper and burlap bands around the trunks of apple trees, which allowed larvae to pupate under the wrapping. The bands were removed periodically by the farmers, the pupae and larvae in them killed, and the bands replaced. In 1927 the bands of paper began to be torn from the trees. At first tracks of the American Crow were found. Finally the crows were observed tearing bands off the trees before and once the winter began. The crows ate some of the exposed insects, but others were left in the paper, which blew around the orchards. Exposed, the insects died over the winter. Small, isolated instances such as this, do not endear the crow to the farmer n09.

Around truck gardens or backyard plots, crows can become a nuisance. In such circumstances, a large scale expensive anti-crow campaign is unnecessary. The presence of a Great Horned Owl decoy may be of some help when used in conjunction with an animated, wind- or battery-powered crow decoy placed at the owl's feet. This may cause crows to avoid the area. An owl decoy on its own was ineffective 11c. If you have a small personal plot of corn that was partially eaten by birds and raccoons, tape the ears





of corn shut at their apices, or tape a small plastic bag over each ear ^{12c}.

Methiocarb

At the Santee National Wildlife Refuge in **South Carolina**, methiocarb was used in the 1970s as a treatment on seed corn. At the rate of 1.4 mg per seed grain, positive results were had. Birds ceased to pull out sprouting corn. On 25 random plots 30.5 m long by 2 rows wide in experimental fields, damaged corn sprouts were counted 4–7 days after sprouting. Methiocarb reduced the damage to sprouts from 44% in control plots to less than 1% in treated plots. But the observations of birds actually damaging the sprouting corn were not made. It was shown that Common Grackles, *Quiscalus quiscula*, outnumbered crows (*Corvus* sp) 8 to 1 on control and 3 to 1 in treated fields ^{52s}. I suggest the grackles (aka crows) may have been the major consumers of sprouting corn in this experiment, and not the crows as we have often been lead to believe.

Our coevolution with the American Crow provided this history lesson ⁹⁰³. “Corvine affinity for maize made the cornfield the stage on which man and bird played out a morality tale of the yeoman versus the feathered trickster.” [A Myth?]

The Birds of Killingworth (an excerpt)

And so the dreadful massacre began;
O'er fields and orchards, and o'er woodland crests,
The ceaseless fusillade of terror ran.
Dead fell the birds, with blood-stains on their
breasts,
Or wounded crept away from sight of man,
While the young died of famine in their nests;
A slaughter to be told in groans, not words,
The very St. Bartholomew of Birds!

The Summer came, and all the birds were dead;
The days were like hot coals; the very ground
Was burned to ashes; in the orchards fed
Myriads of caterpillars, and around
The cultivated fields and garden beds
Hosts of devouring insects crawled, and found
No foe to check their march, till they had made
The land a desert without leaf or shade.

Devoured by worms, like Herod, was the town,
Because, like Herod, it had ruthlessly
Slaughtered the Innocents. From the trees spun
down

The canker-worms upon the passers-by,
Upon each woman's bonnet, shawl, and gown,
Who shook them off with just a little cry
They were the terror of each favorite walk,
The endless theme of all the village talk.

The farmers grew impatient but a few
Confessed their error, and would not complain,
For after all, the best thing one can do
When it is raining, is to let it rain.
Then they repealed the law, although they knew
It would not call the dead to life again;
As school-boys, finding their mistake too late,
Draw a wet sponge across the accusing slate.

– HW Longfellow 1863 (online)



Winter wildflowers along the Assiniboine River





332. An average of **2.2** American Crows (a typical family unit size) per sighting in 3 southern **Ontario** counties over two years, August 1981 to July 1983. During my 70,500 km of year-round travel in a powerful pickup truck, no roosts of crows were observed in the area

	TOTAL	FEEDING	FLYING	PERCHING
Sightings	2,554	28%	43%	29%
Crows	5,558	35%	40%	25%

Canadian studies

A few Canadian studies on the feeding habits of the American Crow will augment what has been accomplished south of the 49th parallel. As an echo to Longfellow's poem, one morning in **Winnipeg** I noticed an adult crow feeding on a lawn in a park near its coniferous nest tree. Through binoculars I saw this crow eat a dozen dark canker-worms in about 30 seconds.

Crops and crows in Nova Scotia

In the 1980s, American Crows roosted in large numbers on Boot Island in **Nova Scotia**. From this offshore roost in winter, the crows spread out



A breeding American Crow searching for its next meal of invertebrates and mice in the thousands of hectares of mowed, sustainable lawn we require to beautify our urban lives

and foraged in Kings County each day. The top seven crops for the county were tame hay, tree fruits, oats for grain, vegetables, potatoes, corn and mixed grains. The number of crows in the various habitats were recorded over two frosty seasons. The crows found corn fields, especially those grown for grain, to their liking. Waste corn was in 75% of the gizzards, and by weight and volume it comprised 70% of their diet. The crows exhibited patchy or clumped feeding patterns.

American Crows around the roost in Nova Scotia were shot and 148 stomach contents analyzed. Rapidly digested material was probably not counted to its actual extent, which reduced the value of the outcome. However, results indicated the amount of food and its availability declined as the roosting season wore on. This may have caused an early decline in the crow population over the winter. Crows exhibited differences in feeding patterns according to a crow's age and sex, as the availability of waste corn decreased over the season. It was difficult to explain these differences. Physiological requirements were a possibility. It was concluded a count of crows per habitat underestimated the importance of corn in their diet, and crows on grassy fields in winter were probably loafers 25m. [Although wonderful loafers, I suggest some of the crows on grassy fields may have been feeding on mice].

Crops & crows in southern Ontario

My study of feeding American Crows in southern Ontario took a different twist. Rather than analyzing the contents of gizzards or pellets, out of





333. From 1981–1983, three habitats, far removed from corn, topped the list where 51% of 1,970 crows were observed feeding. Observations were made as I traveled to dairy farms in 3 southern Ontario counties, Perth, Oxford, and Waterloo, in my powerful, speeding, pickup truck. A total of 29 habitats were defined

HABITAT	PERCENT % OF TOTAL
Hay or alfalfa field	25%
Lawn.....	13%
Small grain stubble	13%
Gravel.....	9%
Pasture	9%
Landfill site.....	6%
Weedy field	5%
Corn Stubble (grain and silage)	4%
Ploughed field.....	3%
Small grain, sprouting to 15 cm tall	2%
Corn, sprouting to 15 cm tall	2%
Newly planted field, bare earth	2%
TOTAL	93%

necessity I took a visual approach. In the dairy region through which I traveled, the three major crops were – corn 49%, small grains 29%, and hay 22%, on a total of 338,000 ha 015-017. Two years of continuous crow sightings from August 1981 to July 1983 were made and noted from the cab of my speeding truck. At each sighting, the number of crows were counted or quickly estimated, without stopping. Sightings were placed in one of three categories – feeding, flying, or perching (**Table 333 above**). A feeding crow carried the most information, so it dominated the category in which a flock was placed. For any sighting, the activity of the majority ruled, and only one category was assigned to each flock. If a pair of crows were observed and one of them was feeding, the pair were placed in the feeding category. What a crow was doing at the initial contact categorized

it. For example, a bird observed flying to a tree where it landed, was marked as flying.

My typical work week involved four field-days. Each eight-hour day began and ended in Guelph. Along the way crows in the city and country were recorded. There were no wintery roosts in this part of Ontario. Over two years, I enjoyed 465 field days and covered an average of 150 km each day. Twenty-nine (29) feeding habitats were noted. In all 2,554 sighting were made of 5,558 crows, for an average of 2.2 crows (the size of a typical family unit) per sighting. Crows in groups of 1 (55%), 2 (26%), and 3 (9%) birds accounted for 90% of the birds in the 14 group sizes established. About 28% of the sightings and 35% of the number of crows were categorized as feeding.

The total number of feeding crows was 1,970 birds. Their feeding habitats are listed in **Table 333 left**. In the three frequently traveled counties, crows foraged most often in young, or cut hay and alfalfa fields (25%). When I combined hay, lawn, pasture and weedy fields, these grassy areas held 52% of the feeding crows. In the past, crows were often accused of feeding in newly



If the bin is empty, the rim is a good perch





28 June 2011. A family fed along the bank of the Assiniboine River between fruiting Cottonwoods in **Win-nipeg**. Crow on right may be an adult; the other two were probably juveniles. Food was abundant

planted fields, and eating seeds, or pulling out recently sprouted soft seeds of corn. I did not notice crows doing this. Newly planted or newly sprouted fields each attracted only 2% of the observed crows. However, in certain light, crows that fed on the bare, dark earth of a newly seeded field

were not obvious. Yet, when fields were being planted, crows were breeding and territorial, with few flocks about. A newly sprouting field of corn appeared quite safe from my viewpoint. Either the crows have given up this habit, the culture of agriculture had changed to make it more difficult to

eat sprouting corn, or crows never did much pulling in the first place.

Crows that fed in green and tan, newly cut hay fields were easily spotted and counted. Consequently, some visual bias exists which may favor crows in hay fields. Keep in mind that crows feed in the open. Fields of long grasses or tall crops, where crows cannot see or find walking difficult, are not frequented by these cautious birds. Families of crows fed in grassy fields most of the year, except in the heat of early summer when these hay fields were lush and congested with tall flowering plants before being cut and baled.

In the three Ontario counties where my sightings were made, the ratio of hay, to small grains (winter wheat, oats and barley), to corn (grain and ensilage) was 1 to 1.3



Along a gravel road, field corn is accidentally spilled, which then becomes a temporary meal for crows, if they find it





An American Crow utilizes everything on its urban territory, even ephemeral water

to 2.2 in 1981–'83. This indicates there were 2.2 times as many hectares of corn planted as there were hectares of hay. In spite of this, many more crows were observed feeding in hay fields than in corn fields. American Crows made a choice in the summer to dine in lively hay fields full of food rather than banal, lifeless rows of corn. An error in this straightforward comparison comes from the amount of time each crop is available for feeding crows. Cut hay fields (usually two cuts per summer) were plentiful over the summer when crows were breeding and tending juveniles, while grain corn was mostly available over the winter, as kernels left on the ground after the harvest. But, come winter, most crows had migrated from these 3 counties of Ontario.

Availability is only one dimension. Those of us who take the time to wander through mature fields of hay before they are cut in early summer, soon notice the abundance of insects, mice, spiders, rabbits, birds' nests, snakes, and the lack of crows feeding in such fields. When the hay was cut and swathed, these inhabitants were exposed to the opportunistic feeding of walking crows. When a tractor ran over animals during hay cutting, the bodies may be found and eaten by crows. A walk through a sprouting field of corn was a bleak contrast. Modern chemical and mechanical weed control kept the 75 cm wide space between the rows of grain corn quite bare of plants. In such a sterile environment, insects were few and crows were not attracted to such a barren

habitat. However, one early summer morning, I was lucky enough to watch a lone crow marching along rows of young corn plants about as high as the bird. The crow ate insects on the light green, arching corn leaves.

In Essex County **Ontario**, as I was driving home late one October afternoon, 150 migrating crows gathered at the edge of a standing field of grain corn prior to its harvest. Some of the crows entered as far as six rows in from the edge to land and feed on the tips of cobs of ripening field, not sweet, corn. In the background, a swarm of 1,000 starlings quickly settled into the central part of the same field to feed out of sight on the corn. Which of the two species of birds do you think a farmer might see and talk about? Yet, in 3 years of weekly visits to dairy farms in the three counties of Ontario, not once did I hear a farmer complain about "those goddam crows" or any other bird eating their crops – and they grew a lot of corn. From one of my crop science classes, I do remember one teacher mentioned the problem of blackbirds (not crows) eating corn in southern Ontario. One naive student suggested placing nets over corn fields to keep the red-wings, starlings and grackles from the ripening kernels.

Resistance was added to the seed (Bt corn, was created by adding a gene from *Bacillus thuringiensis*, a bacterium in the soil that produces insecticidal toxins), which kills some caterpillars that feed on corn. Seed treatments can also be used, or a soil insecticide at planting





time. Post-emergent herbicides control broadleaf weeds and grasses. Flocks of crows do not feed in modern corn fields in the spring; there is nothing to eat. It should be remembered that crows living in cities have no corn to consume, yet the birds manage to live and nest successfully. The only corn they might eat would be processed corn chips spilled by a researcher on a sidewalk near a crow's nest.

In another study in three southern Ontario counties – Essex, Norfolk and Niagara, birds and researchers together visited four crops – corn, soybeans, apple orchards, and vineyards. Birds were surveyed in 1987 and 1988 using point counts and transect counts. Let's begin with delicious corn. For birds recorded on more than 50% of the survey visits to a cornfield from May–September, American Crows did not make the short list of 14 bird species. Red-winged Blackbirds were the most numerous species foraging in fields of corn from July–September. Next, the researchers entered fields of soybeans. Of 16 species of birds, 6 crows were observed foraging in a field in May when the beans were planted and pesticides applied. Strolling through apple orchards, crows were one of the 14 birds observed 50% or more of the time. Their numbers were 10 or less in any field and at any one time. Finally, in vineyards, crows were not among the top 8 bird species observed. In summary, 138 bird species were counted in the four crops over the two years, and 25 of these were seen on 50% or more of the visits to the fields. Most bird species were uncommon, ie. seen on less than 25% of the visits by the researchers. As expected, birds were mostly associated with the edges of crop fields. Some implications of applying chemicals to crops where birds fed were discussed in this study ^{46b}.

Stable isotopes

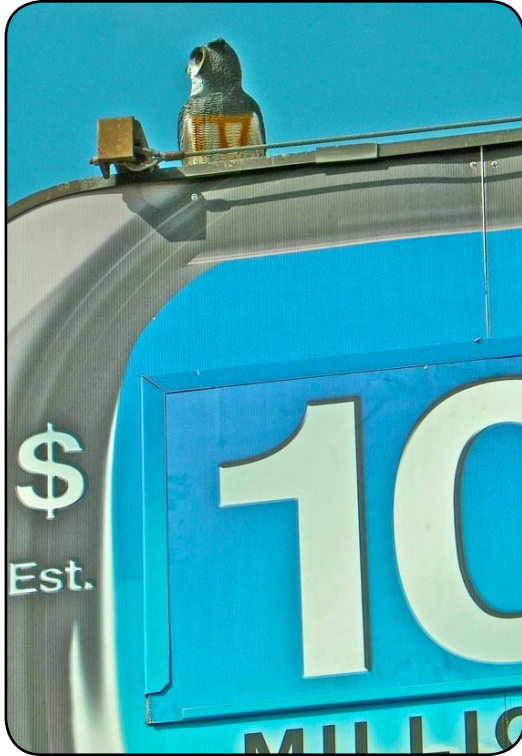
Along with gizzard and pellet examinations,



another method of determining some very broad dietary information was tried. It dealt with turnover rates of stable isotopes in the blood of birds. One advantage was its nondestructive nature. One disadvantage was the birds had to be captured and a small blood sample taken, preferable over time (weeks) to observe changes in their diet. The blood was spun to separate cellular and plasma fractions. Diet-derived ^{13}C was assayed to find its turnover rates in the two parts of the bird's blood. Nine, two-year-old captive American Crows, with average weights of 404–428 grams, were fed a wheat-based diet for 38 days, then switched to a corn-based diet. Corn utilizes a C_4 photosynthetic pathway and was enriched with ^{13}C compared to the C_3 pathway in wheat. The wheat and corn diets had stable-carbon isotopic concentrations of -21% and -15% respectively. The cellular part of the blood shifted toward more positive values during the experimental dietary changes over time. The average half-life of 3 days for ^{13}C in the blood plasma gave information on short-term diets. With the cellular fraction of blood having an average half-life for ^{13}C of 30 days, its isotopic assay provided insights into diet from about two months ^{03h}. However, it seems to me that in the wild, the large variety of foods that crows feed upon, even in one day, makes this methodology not particularly useful.

Another study established the turnover rates of ^{13}C using primary wing and tail feather samples of crows that were assayed isotopically. Only during feather growth did the stable isotope values reflect the difference between the wheat and corn-based diets. The daily growth of primary feathers averaged 8 (6–11) mm. When dietary carbon was inserted into growing feather tissues, there was a change in the isotopic value based on the diet. For crows, the mean fractionation factor between diet and feathers was $+3.5\%$ for corn and $+4.4\%$ for wheat. After growth, the feathers were inert





If a scarecrow doesn't send the crows packing, try a fake Great-horned Owl. It won't do much good either

and of no use in this type of study ^{01h}.

Crow nestlings, about 12 days old from four families, were fed separate diets of fish (perch) and grain. Three of the four families showed faster weight gains on the fish diet, and showed lower nitrogen diet-tissue fractionation values in all five tissue types – blood, liver, muscle, collagen and feathers. This difference may have been caused by nutritional stress and not just their diets. The carbon diet-tissue fractionation values varied for the five tissues, especially for blood and feathers. The fish-eating nestlings reached a weight of about 350 grams by their 30th day of age ^{02h}.

British studies

America was not alone in its cry over the crow. Across the Atlantic, the British addressed their Corvidae, and not without the usual difficulties. In an early study ^{c98}, that was reviewed in *The Auk* ^{m67}, 830 stomachs of

Rooks, *Corvus frugilegus*, were collected and examined in **England** and **Wales** over 12 months. Animal food averaged 15% over the year (1% in January; 40% in July). Wheat was the main food along with small amounts of weed seeds, acorn mast, gooseberries, currants, grass roots and potatoes. Beetles, larvae, and caterpillars, were abundant, but grasshoppers and crickets were absent from gizzards. Mice, rabbits and young birds (including blackbirds) were noted. Eggs of blackbirds and pheasants were taken from 1 and 5 of 830 stomachs respectively. The Rook enjoyed the same general diet as did the American Crow. Nevertheless, the researcher W Collinge wrote in his bizarre conclusion “its usefulness might be considerably increased were it few in numbers.” Apparently in Germany, the Rook takes about 66% animal matter during the year, making it more useful in a general sense.

Working through Collinge, Keeper of the Yorkshire Museum, the corvids have shown they too are persecuted far out of proportion for a few weeks of misbehavior. Large signs should decorate the countryside to commemorate the unnoticed, annual aid crows continually give to the agricultural community.

By 1930, Collinge ^{c99}, collectively described the diets of the Carrion / Hooded Crows, as well as the magpie and jay, as: beneficial 35%, injurious 18%, and neutral 47%. Under beneficial he cited –

- (1) Injurious insects 21%
- (2) Mice and voles 11%
- (3) Slugs and snails 3%

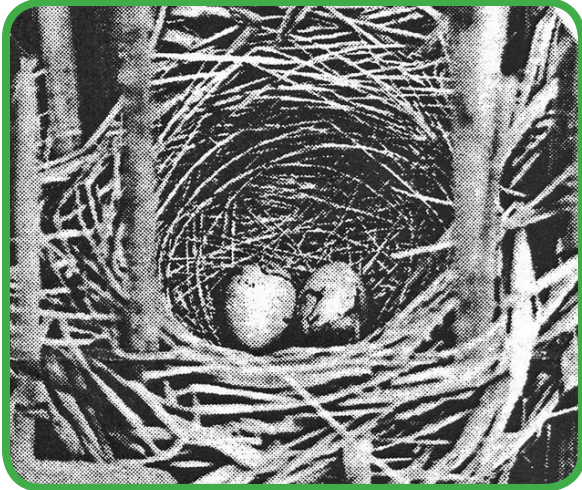
His noteworthy closing remark, “the four species are all distinctly beneficial to agriculture.”

In Essex County of Wytham in southeastern **England**, a neck collar was used to trap food fed to nestlings of jays and magpies. From 15 magpie samples, 357 items were retrieved. The top 3, all insects, as a percentage of the total –

- (1) Lepidopteran larvae and pupae 41%
- (2) Coleoptera 21%
- (3) Diptera 16%

Magpies gathered their food mainly on the ground





The nest of a Red-winged Blackbird woven among cattails. The male red-wing harasses American Crows that fly nearby. No one has described an instance of crows eating the eggs or nestlings of red-wings in North America

or in oaks 029.

Before leaving England I would like you to meet David Holyoak of the British Trust for Ornithology. This man was not satisfied with the results of previous crow-gizzard-content analyzers. He set out on a personal quest for a distinctive truth, one more to *his* liking. Advertising his need for bodies, and doing a little shooting himself, he soon had piled high on his dissecting table

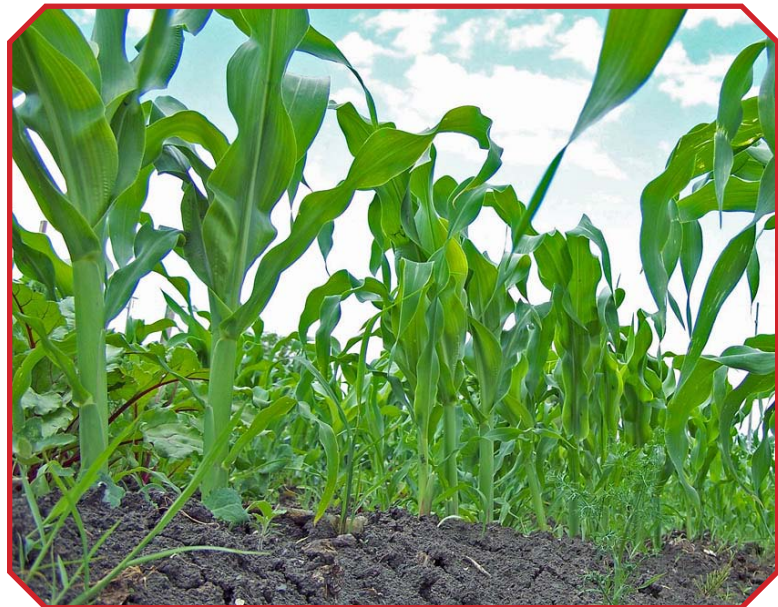
234 Carrion Crows
264 Rooks
222 Jackdaws
77 magpies &
74 jays

gathered throughout the seasons. He began to work; then he finished working. Holyoak articulated his findings according to the frequency of occurrence of the different food items, knowing the limitations and deceptions inherent in this method. His report carried no surprises. Grain, wild plant seeds, mice and voles, carrion meat, earthworms and their eggs, grassland insects and birds' eggs were the seven most

common and important items of his 34 categories of food. Grain and insects were the only two categories consistently found in the gizzards of the crow, Rook, magpie and Jackdaw. Unlike the previous reports cited, Holyoak, with true British reserve, did not comment on the Goodness of Corvidae 21h. Since he did not come out with obscenities against this refined group of birds, I will assume the corvids were, as scientists and observers before him had discovered, useful to have in your backyard.

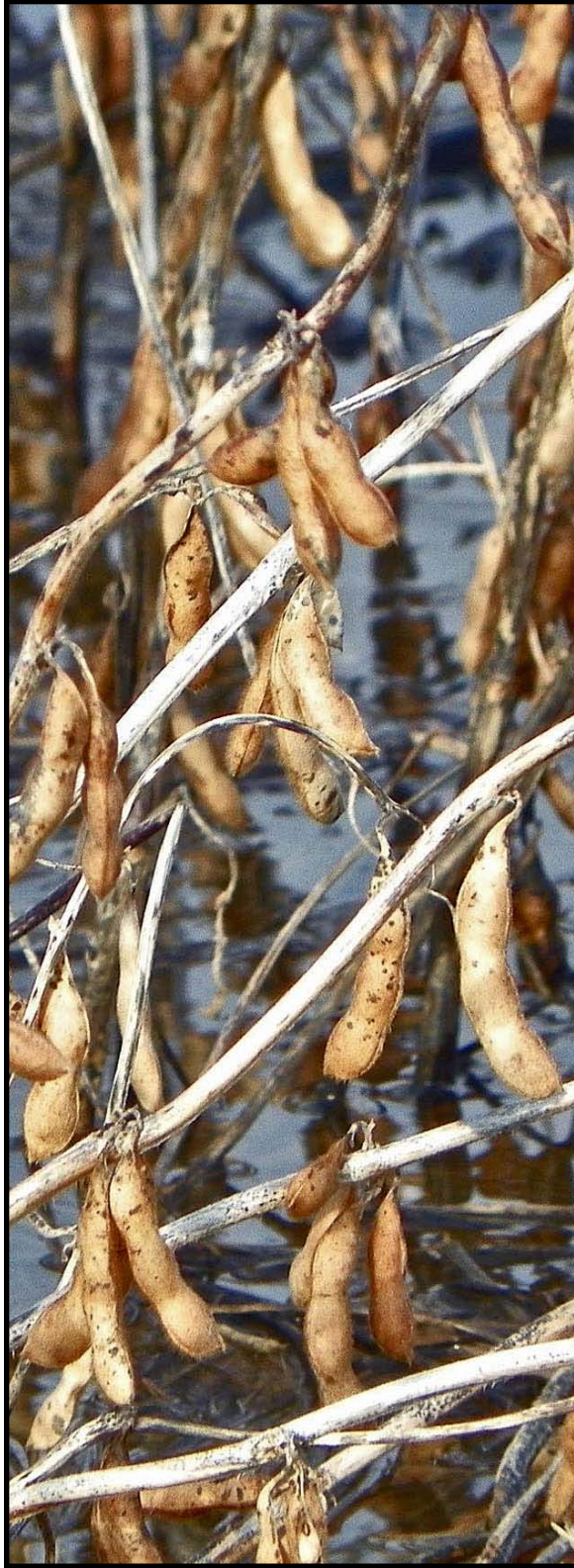
The corn laws

With all the talk and political wrangling devoted to the free trade issue between Canada and the United States during the mid-1980s, I am pleased to report that crows have been concerned about such dealings long before the present politicians were born. Crows are like that. To begin this story, not long ago I found a very thin book, certainly thin enough to use as a marker for some of the heftier ornithological editions I've pulled from the shelves. The entire bulk of this 1844 book, 9 pages, was consumed by a letter from A Crow, to one Richard Cobden 50c. Now we all know A Crow cannot type, so I assume the bird dictated this important message to an understanding,



A field of sweet corn this tall and with few insects, is not used by American Crows that prefer more lateral visibility as they walk about searching for food. Cut hay fields were preferred





Unharvested ripe soybeans pods are easily opened by the strong bill of an American Crow

sympathetic human. A Northamptonshire Squire was the translator between the two civilizations this time.

Before I discuss this intriguing letter, a brief explanation of the British situation in general and Mr. Cobden in particular is necessary. In the 1800s Britain, unlike many countries, was not self-supporting in food through her agriculture. Whereas most countries enlisted protection for their manufacturing sectors, Britain installed a similar system to guard its agriculture. Foreign competition was excluded, and protectionism in the form of Corn-laws, etc. were legislated to cure its ills.

Richard Cobden, a Member of the British Parliament, was described as being a practical man who ruled little by sentiment and more by his reason and convictions ^{a60}. His patriotism was directed to improve the overall standard of living for Englishwomen. During the 1840s and '50s, Cobden was a very active speaker and leader on behalf of free trade in food. He campaigned against the Corn-laws. To combat this unnecessary law, in 1839 a permanent union, the Anti-Corn law League with Cobden at the helm, was founded. Backed by the farming community, their struggle was eventually victorious. On 27 January 1846, the government under Sir Robert Peel, announced that in three years the Corn-laws were to be repealed ^{c91}. For the next three decades, agriculture in England improved, as Richard Cobden, a traveller, said it would.

This letter from A Crow, dated 1 April 1844 was from Cawvent Gardens. In it, the crows quickly proclaimed the oneness of their cause with that of Mr Cobden's. After outlining their relationship with agriculture and farmers from the time of the Egyptians, the crows suggested to Mr. Cobden, whose League had recently suffered a setback, to join forces with them in repealing the Corn-laws. In return, the crows would also ask him to propose a bill to repeal Scare Crows. "The speeches of our friends, especially the abusive part, which is their style, would fit scare-crows just as well as Corn-laws." They reminded him, "that both serve their purpose, – keeping the corn in and the crows off." With regret, A Crow ends the letter with, "I am Sir, One you've got to pick with the country."





American Crows in a park

The Political Crow

A poor old crow,
Who was hungry and lean,
From a rich old bird
Stole one white bean.

So they flung the thief
In Caw-Caw jail,
And they kept him there
And refused him bail.

But another bird,
Who had lots to eat,
Stole sixty bushels
Of corn and wheat.

“This bird” cried the crows,
“Has political bent.”
So they sent him to Caw-
Caw Parliament.

– Wilson MacDonald 1930 m06

My review of the large feeding studies on the American Crow and the family Corvidae, both at home and abroad is complete. The results echo each other. The record needle is stuck on beneficial. How to handle crows when their relationship with agriculture goes slightly off center is best exemplified by Bruce Thompson (pers. comm. 1985) of the Texas Parks and Wildlife Department. It permits **NO HUNTING** of the crow. Instead, hunt-

ers are invited to a crow shoot when a landowner can show crop damage. This philosophy, neither new nor modern, appears to be the most honorable. It should become the **GOLD STANDARD** across North America. From the poem, The Crow, by McIndoo –

He thinks that to eat of young corn so sweet
Should not be so sadly lamented;
Since he gorges on bugs, field mice, and slugs,
The farmer should be quite contented!

– WO McIndoo 1914 m88

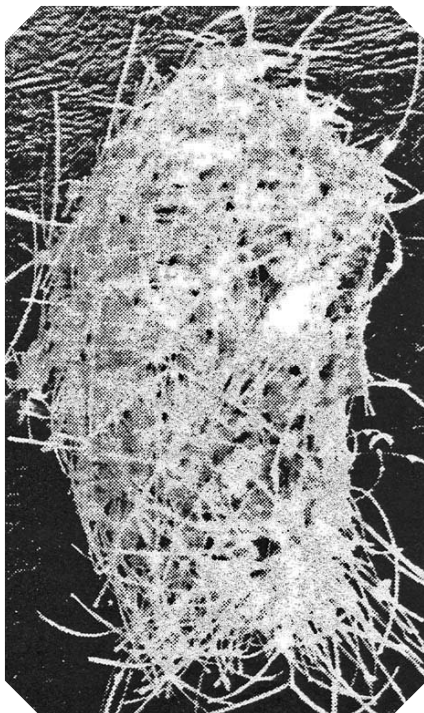


A breeding American Crow, far from any agricultural display, gathers the next meal in an urban landscape for its young in **Winnipeg**





A regurgitated pellet about 3 cm long marks the spot where an American Crow roosted on a paved industrial yard in Chatham **Ontario**, 8 December 2011, on a wet night. The pellet was disintegrating. Perhaps waste soybeans gave the brownish pink color to the pellet

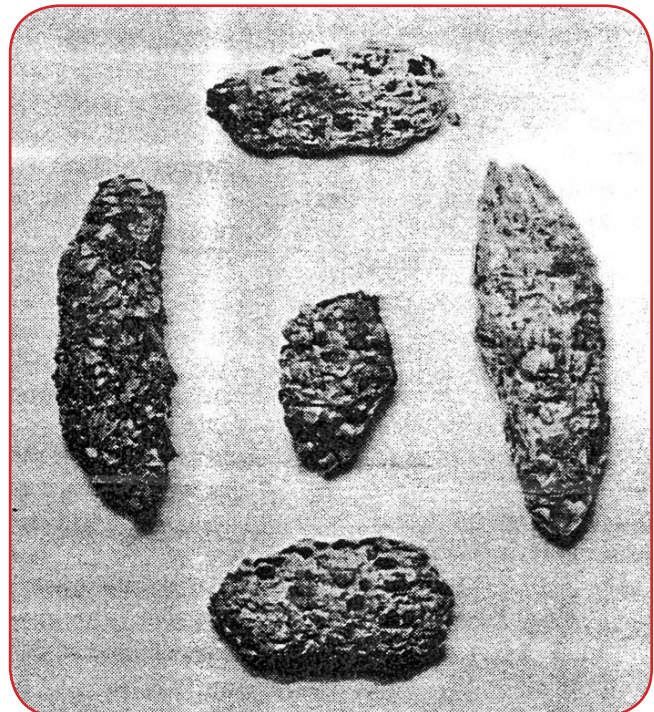


The largest and most texturally unique pellet measured 6.3 by 2.5 cm. It was regurgitated by a crow in Essex County **Ontario**. I never did find out what it was made of

Before we return to some of the eating habits and smaller feeding studies of the American Crow, I'll describe the regurgitated pellets (castings) that crows produce during the day. Pellets are ejected, probably each day and are easily obtained at a large wintery roost especially when crows assemble and roost on the ground.

Regurgitated pellets

Although regurgitated pellets are best known from hawks, crows and owls, as more birds are having their sleeping quarters checked, the list of species which eject castings keeps growing. One recent addition was the Common Grackle ^{t86}. In Britain alone, Maxwell Knight was aware of over 60 species producing pellets ^{t33}. Birds with and without true crops eject pellets. Eight species of corvids cast pellets. A female Western Scrub Jay gaped widely and ejected a 12 x 8 x 5 mm pellet in the afternoon onto a sidewalk in Reno **Nevada**. Within this small pellet, 1,741 fragments were separated – parts of insects, 14 plant seeds, and 26 bits of grit ^{e31}.



The average pellet size was 3.3 (1.5–5.4) cm by 1.7 (1.0–2.1) cm. Collected at the Essex **Ontario** roost





In a parking lot, a juvenile American Crow in mid-July explores a possible food source from many angles

On Mitlenatch Island in **British Columbia**, where no crops were grown, Northwestern Crows fed among seabird nesting colonies on the eggs, as well as along intertidal beaches and meadows. From the start of June to the end of August, 184 regurgitated pellets were collected from all but the heavily wooded sections on the island. A breakdown of the pellets produced 25 food categories. The top three food items by volume –

- (1) Blackberry 27%
- (2) Shore Crabs (2 species) 19%
- (3) Roughage 14%

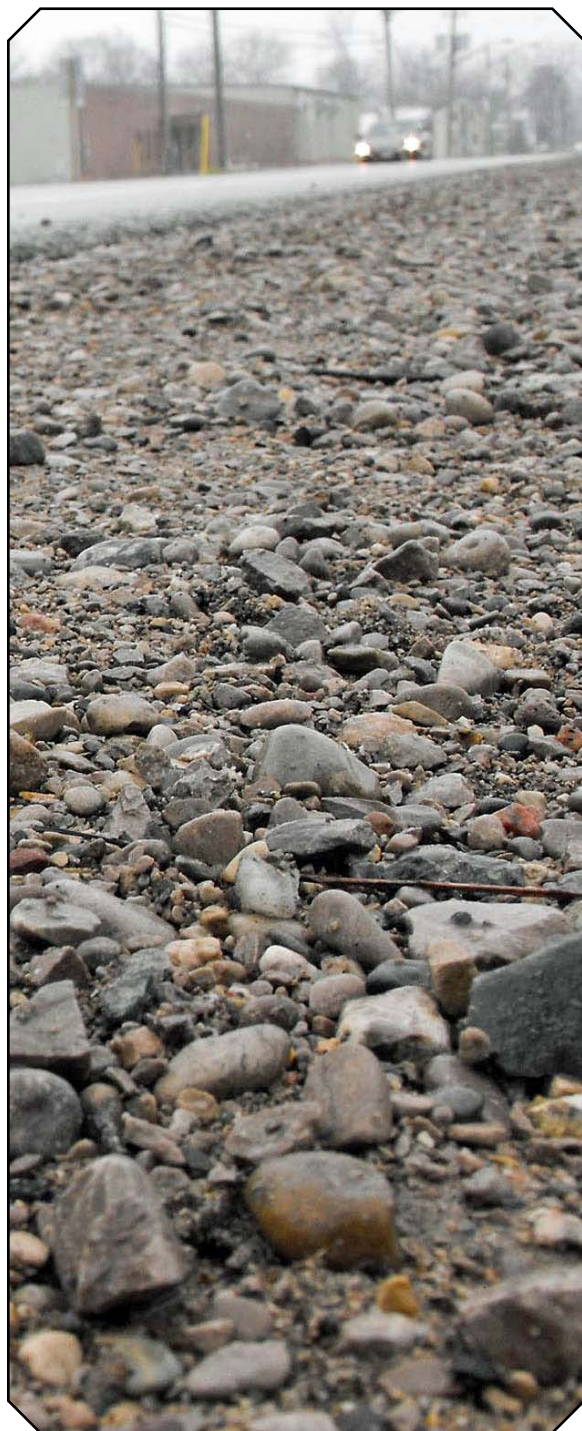
Addition of this triad is 60%. Eggs were near the bottom of the list, even though NW crows pilfered hundreds of cormorant eggs (more on this later). Northwestern Crows also fed gull shit to their nestlings on rainy days, a snake 45 cm long was eaten, and on two occasions a crow carried a young Deer Mouse, but the kills were not recorded 3b8.

Throughout the day, and at its end, American Crows regurgitate pellets, thereby effectively emptying their gizzard. One pellet was often produced shortly after sunset. The composition of pellets gathered at roosts consisted of gravel, brown flaky material (chaff), plus various seeds and bones. Only twice have I observed a crow producing a pellet in the daytime. It appeared to be a rapid and easy process. Both instances were by crows perched in a tree. Norman Criddle raised four young American Crows and noticed the ejection of a pellet happened quite suddenly and “without any conscious effort on the part of the bird.” The blinking or closing of their eyes accompanied the process which required only a minute to complete. Usually only one pellet was ejected, but Criddle counted as many as three pellets in rapid succession. The crow recovered its awareness immediately after the pellet was ejected. Sometimes these pellets were produced shortly after eating, and they contained whole, undigested food 40c. This “wastage” was attributed





to the crow's supposedly large appetite t⁷¹. A student of the Northwestern Crow watched 15 crows feeding on blueberries in mid-July. After shifting to a beach area, the crows regurgitated 14 pellets within 30 minutes. The berries showed almost no



Roadside gravel provides grit for crows

sign of being digested 3b⁸.

A caged crow was fed a variety of foods, and a pellet was ejected 1–4 hours later b³⁸. There is variability. I had one captive crow that did not make pellets. The number of castings a crow produces in 24 hours, or a week, is unrecorded. Near the Essex **Ontario** roost, a pre-roosting assembly of crows on the ground, 1 to 2 hours before sunset, left few if any pellets behind after the birds shifted to the next field. The final assembly on the ground, which may last up to an hour past sunset, was a good source of whole pellets the next morning. Or, if crows roosted on the ground in an open, relatively flat field, the pellets were intact and available for study the next morning after the birds departed for the day. In wet weather, an isolated pellet in a field quickly disintegrated, leaving an obscure, tiny cluster of gravel. In 295 gizzards of crows killed in **Oklahoma** by blasts of dynamite two hours after the crows entered the roost, only 8% of the gizzards contained food; pellets had already been regurgitated from the rest (92%) a¹¹. Most of the roosting crows spend the night with an empty stomach, even in winter.

When crows roosted overnight in trees, a warm, soft, falling, regurgitated pellet usually hit branches before reaching the ground. Only a few made it intact to the floor. While wandering inside the woodlot in late winter, which the crows in Essex County **Ontario** used as a roost, I knelt beneath a bare deciduous tree favored by the sleeping birds. The floor was a dark tan color. A flat, frozen pancake, 5 m in diameter and 5–10 cm thick, surrounded the tree trunk. The chief ingredients were thousands of broken pellets garnished with crow shit.

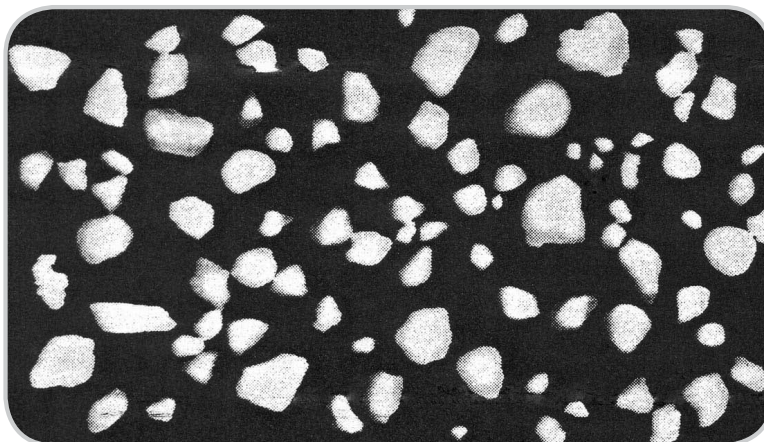
Pellet color and texture were related to what the crows ate. A high amount of gravel imparted a rough, gray, pebbly appearance. Eating mice and voles made a pellet furry, gray and soft. Feeding on waste corn added a primary yellow hue, and insects gave a pellet a diversity of patterns and tones. Bits of glass, rubber bands, cellophane, or part of a red balloon added a little sparkle to a casting. The most unusual pellet I found came from an anonymous crow in **Essex County**, which on the evening of 16 February 1984, produced the object pictured on [page 341](#). This extreme pellet, 6.3 x 2.5 cm, was composed of opaque, unidenti-





fied, hair-like material, except for five broken pieces of corn and bits of gravel.

Occasionally, I watched the live video of a pair of Red-tailed Hawks that nested on a metal light compound above the sport stadium at Cornell University. One standing nestling, still covered in light gray feathers opened its mouth as if to vomit. Instead, a gray pellet was ejected toward the outside of the rim of the nest. The nestling's eyes remained open, and the complete process of ejecting the pellet took about 15 seconds.



Regurgitated pellets from American Crows in Essex County **Ontario** over the winter held 0–258 pieces of grit (gravel) 1–6 mm long. The grit was selected for its blunt shape. Crows swallow gravel every day to help their gizzards grind food. Gravel in this photograph is about twice the actual size



Photogram of a small sample of bones of mice, shrews, etc found in regurgitated pellets from roosting crows at Hamilton, **Ontario** in March. Thousands of pellets beneath the trees were furry, as if mice were the only item on the menu

Grit in pellets

On 24 December 1984, I systematically gathered 100 whole regurgitated pellets from a bare, snow-covered assembly area near the Essex **Ontario** roost. When first ejected, a warm pellet melted into the thin cover of snow. Each pellet was measured *in situ* before being placed in its own plastic bag prior to analysis. The average pellet size was 3.3 (1.5–5.4) cm by 1.7 (1.0–2.1) cm. An average pellet from the 100 contained 68 (0–258) pieces of gravel (gizzard stones). Each piece of gravel that I measured was 1 mm across or larger. Fine, sand-like pieces were ignored. More pieces of gravel were found in the bigger castings, but there was much variation to this generality. For example, two pellets of equal size, 2.0 x 1.5 cm, contained 10 and 40 pieces of grit (gravel). The size of the grit also varied. A sample of 160 pieces of grit from each of two pellets weighed 5 and 10 grams.

In Lancaster **Pennsylvania**, during the winter of 2005–'06, several crow roosts were visited. (Annala 2012). An opportunistic collection of 113 pellets was made. Based on voice and CBC counts in the winter, it was believed about 10% of the crows at the roosts were Fish Crows and the rest (90%) were American Crows. Pellets of Fish Crows were similar to pellets of American Crows,





but somewhat smaller. Overall, the 113 pellets had an average size of 3.3 cm long by 1.7 cm wide. These two measurements were identical to the two I obtained for the average size of pellets of American Crows at the Essex roost in **Ontario**.

Much of the material (35%) in the 113 dried pellets collected from roosts at Lancaster was too

larger grit size than expected, based on their body size. Crows also swallowed one of the broadest ranges of grit size among the birds. Only 60% of their gizzards held grit, and the average gizzard contained 2 (0–234) pieces over 1 mm wide. The mean size was 3.4 (1–6) mm. Overall, American Crows selected a wide range of grit sizes, but within a restricted shape, choosing rounded bits of gravel with few sharp edges or points on the surface 04b.

Five insecticide granules in the 0.5–0.6 mm size and of different shapes and colors were used in lowan cornfields to control Corn Rootworm. Ingestion of these pellets as grit would kill birds that commonly fed in cornfields 05b. The granules were applied at planting. What wasn't mentioned was what percentage of the pellets were buried in the earth and what remained on the surface when applied? Also, how soluble were the granules in rain? These questions aside, the insecticide granules were near the lowest size that crows and other birds ingested for grit. At the time of application of the granules, crows were probably not feeding in bare fields of recently planted corn. In another 1990s study, 64 crow gizzards were emptied and grit was found in 53% of them, with a mean size of 2.9 mm 923. We do not

know how long individual pieces of grit remain in a bird's gizzard, or how often crows swallow gravel during the day.

One of the first things some crows did after leaving the **Essex** roost in the morning was to land on a gravel road and swallow gravel. On the



Shadow of an American Crow feeding from the corner of an eavestrough in September in **Winnipeg**

small to identify. However, vegetative remains included corn seed fragments along with bits of stems and leaves. Overall, weed seeds made up 8% of the composition. The two most common seeds from Poison-Ivy, *Toxicodendron radicans* (or *T. rydbergii*) were 4.5 mm long by 3 mm wide, and from the tree, Common Hackberry, *Celtis occidentalis*, 6 mm in diameter. The seeds (fruit) remain on the plant overwinter. A few bone and tooth fragments from small mammals were found in 6 (5%) of the 113 pellets. Grit made up almost half of a pellet's weight.

In **Iowa**, American Crows in cornfields were shot by hunters during the winter. Their gizzards were emptied of food and grit. Compared to the other 22 birds species in the experiment, the 34 crows ingested a



Crows in July exploring stuff in an eavestrough in **Winnipeg**





return journey to their dormitory an hour before sunset, more grit was ingested as a black ribbon of crows covered a gravel road and continued down into the bordering ditches. The birds often turned their heads sideways when they picked up gravel with their bills.

Gravel, stomach stones, or grit (whichever you prefer) in a bird's muscular gizzard is presumably used for grinding seeds and other hard material. One puzzle remains – why are stones not found in all the stomachs of a species? From a collection of 303 Meadow Pipits shot near Wales, only 56% had grit in their stomachs. These birds were obtained from March through October. The absence of gravel may indicate stones are a source of trace elements instead ^{w12}. American Crow pellets I examined in the cold months almost always contained grit. The exceptions were the castings composed of vole / mouse remains (fur and bones). These contained few to no stones. Near Edmonton **Alberta**, grit was present in 27% of the pellets obtained from Black-billed Magpies roosting in the winter ^{r20}.

Some crow-watchers sought a relationship between the amount of gravel and the amount of hard seeds in a bird's stomach. The contents of 37 crow gizzards indicated a possibility of substitution. When the average grit volume was 7.5 cm³, hard seeds amounted to only 0.9 cm³. When the average grit volume was 0.4 cm³, the hard seed volume rose to 2 cm³ ^{11w}. In gallinaceous birds (pheasants, grouse, etc) the substitution process was more easily defined ^{b74}.

The number of seeds in pellets also varied. Twenty-five of the 100 regurgitated pellets I collected in **Ontario** contained 633 whole seeds for an average of 25 seeds per pellet with seeds. Whole crop seeds were not present. Of the 633 seeds, 490 (77%) were from Staghorn Sumac. Eighteen pellets held sumac seeds and 15 of the 18 sumac seeds exclusively, for an average of 31 (2–116) seeds. In passing, 100 air-dried Staghorn Sumac seeds weighed 1.2 grams. Also in the left lane, I have never observed crows in Essex County feeding on sumac fruiting heads. At the St Catharines roost in southern **Ontario**, about 40 crows ate sumac seeds shortly after sunset before the birds entered trees to roost for the night. Staghorn seeds were also found in crow pellets in





A couple of Wood Frogs discussing the feeding habits of crows over a floating cattail fence

Massachusetts. A compilation of the most common seeds in a 662 cm³ sample from a wintery flock in Massachusetts included Bayberry, Poison Ivy, and three sumac species – poison, staghorn and smooth t⁷¹.

Seven of the 100 pellets from the Essex **Ontario** roost held bone fragments. In those 7 pellets, the average was 5 (1–13) pieces of bone for a total of 32. Very tiny pieces were not counted. A visit to the **Hamilton** roost in the spring revealed many pellets with small mammal bones in them. On 22 April 1982, I slowly walked along 200 m of trail in the Niagara Escarpment where the crows slept in Hamilton. Whenever I stopped, castings at my feet had a furry feel and look. Beneath the fur were the white bones, jaws, teeth, etc, probably of the Meadow Vole, a widely distributed and com-

mon mammal. This vole moves in grassy areas day and night throughout the year. Meadow Voles damage fruit trees, hay, and grain crops. When crows were loafing in grassy areas, they were most likely alert for small mammals.

In **Alberta**, 64 pellets from Black-billed Magpies were examined in late February. Bones and teeth of the Meadow Vole resided in 67% of the pellets. It was concluded voles were an important food item in the magpie's diet r³⁰. A 1940s study engaged the Eurasian Magpie, *Pica pica*, in the village of Kovarce in **Slovakia**. From a roost of about 50 birds in winter, 250 pellets were collected. The regurgitated pellets averaged 2.9 x 1.7 cm, and had an average weight of 1.1 grams. The pellets averaged 13 seeds including some waste corn and wheat, but more importantly, the bones of small mammals – House Mouse, Harvest Mouse, Field Vole, Ground Squirrel, Common Mole and White-toothed Shrew. Four birds were identified, along with parts of dung beetles, carion beetles and earwigs t⁷⁹. Magpies, like crows, enjoy a well-rounded diet.

From other pellets gathered at the Essex and Hamilton **Ontario** roosts, an open-air-dried pellet averaged 4.2 (1–11) grams. Three bulk samples were picked from fields around the Essex roost. A 100 g portion from each open-air-dried lot was divided into 3 categories and weighed. The averages were –

- (1) Gravel 55 (45–60) grams
- (2) Brown chaff 41 (35–53) grams



With their strong bills American Crows easily rip into plastic garbage bags to feed on our leftovers





The back of an American Crow

(3) Seeds, bones and tinfoil 4 (2–7) grams

The weight of gravel in crow gizzards from **Nova Scotia** ranged from 13% to over 30% of their total dry weight ^{25m}. From crows in **Illinois**, grit occupied a 20% volume in 718 gizzards and an 18% volume in 1,214 regurgitated pellets ^{20b}.

Birds are worth it

How important are birds to our well-being? How do they help us, and how can we place a monetary value, whenever possible, on their assistance? These questions have been asked for decades. In our present economic situation, birds are certainly more important in every way than some greedy banker or Wall Street clown. And birds are more beautiful and songful.

Recently, it was again suggested we gather data on four services provided by birds and place a monetary value on the services ^{w52}. Personally, I doubt if this old idea will catch hold. Disagreements will be based on subjective arguments that would render the process useless.

- (1) Provisioning** – natural products directly used by us for food, clothing, etc
- (2) Cultural** – recreational and inspirational aspects
- (3) Regulating** – pest control and carcass removal
- (4) Supporting** – pollination, seed dispersal, nutrient cycling, etc

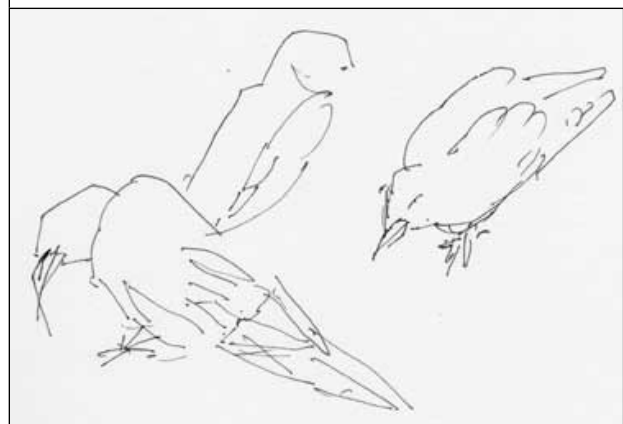
Crows in Florida

In **Florida**, crows in the early 1920s rarely fed on grain, preferring frogs, lizards, snakes, grasshoppers and snails ^{b09}. Naturally, in keeping

with the critical bubble of the time, it was noted that crows ate the eggs and nestlings of herons, anhingas, ibises and other waterbirds. One observer wrote – “In every part of the country where I have studied them, I have found them very destructive birds as a whole.” I wonder if he was actually talking about the feeding habits of Fish Crows, which are common over much of Florida? Did he know Fish and American Crows were 2 different species with different feeding habits?

Continuing with the crow in Florida, in the 1880s, DB Mortimer observed – “It is common to see it [the crow] feeding about the streets and vacant lots of Sanford, especially when the palmetto fruit is ripe enough to eat. It associates freely with the Boat-tailed and Florida Grackles, and also with the Red-winged Blackbird and the Rice-bird, and I have seen flocks including all these species enjoying themselves about the town” ^{59m}.

The endangered Snail Kite occupies south-eastern Florida. Over 10 years from 82 nests,



348. Crow Outside the Door. Drawing © Alison Kent, with permission





crows (Fish and perhaps the American) took only 8% of the total that was lost from predation. However, within the predation category, 58% of losses were from unknown predators. It was mentioned that crows of both species were uncommon in the Everglades, except along the Tamiami Trail (Highway 41) where American Crows used the upland margins, or cypress and mangrove forests, areas mostly devoid of nesting Snail Kites ^{0s3}.

Once again, predators were at the nesting colonies of wading birds in the everglades of southern Florida. Most of the colonies (85%) were in stands of willow trees. The highest nest failures occurred from mammals (20%) and snakes (23%). "American Crows were seen (or heard) on only three occasions at one of the 40 colonies visited at least once, despite over 750 total man-hours spent in colonies." Purple Gallinules did eat eggs of the herons when they were not

lizes the lower jaw used by the jay when it pounds an acorn. A hatchling of the Fish Crow lacks a buttress complex as does the American Crow. Instead, "the quadrate is separated from the rostral portion of the articular cartilage by a wide gap." Without the buttress, some corvids may have one or both mandibles suitable for pounding ^{z14}. I have seen an American Crow pound the round, 9 mm wide, hard, nutlike fruit of a Basswood tree. After several whacks that did little damage, the crow dropped the fruit and flew away.

Here are a few observations on an American Crow's pecking style. With an unshelled peanut "the crow held it against a branch and pecked it tentatively with both mandibles. It then pecked more vigorously with the bill slightly open, penetrating with the lower mandible at an acute angle to the surface." With a chicken bone, the softer cartilaginous ends were pecked. The pecks were



The reddish fruit, 3–4 mm in size, from sumac heads provide nourishment or grit to crows over the winter

on their nests, including being flushed from their nests by members of the study team ^{f65}.

The bill as a tool for feeding

American Crows often visited the suet sites in the forests near Hinesburg **Vermont**. They usually pecked at large pieces or at a protruding section to get enough to eat. Peck marks were left behind. Then one raven of many, aligned its pecking to create grooves in the suet that allowed it to remove larger chunks for storage. It was the only corvid carving the suet in this manner ^{h63}.

The Florida Scrub-jay has a very effective method for opening acorns. It stabs an acorn with its lower mandible. Then using both mandibles it tears open the shell. This was possible due to the formation of a buttress complex (modified parts of the lower jaw, quadrate and cranium), which stabi-

directed at a shallow angle to the surface allowing the lower mandible to penetrate the bone. Then both mandibles tore off pieces. When a hole was formed in a long bone, "the crow inserted its lower mandible into the marrow cavity and scraped it backward against the inner surface of the compact bone, extracting marrow. The crow's approach to hard foods was more exploratory and less stereotyped than that of the jay" ^{z14}.

Smaller feeding episodes

Large scale surveys on the feeding habits of a courage of crows provide a large picture to ingest. When we shift our attention to the edges of a canvas, we can concentrate on smaller sections in more detail. As we seemed to be fixed





American Crow arriving at the edge of a lawn where I placed 15 pieces of hotdog and some shelled peanuts for my caching study. The bird's body is small in comparison to the wide outstretched wings and 12 fanned tail feathers. A black arrow points to the separation point between the 10 primary and 10 secondary wing feathers. The red arrow indicates the middle gap in the tail feathers. Primaries 6–10 are splayed and curved

on agriculture, I will dwell on the crow's fondness for insects a while longer.

S Rathbun in Seattle **Washington** mentioned that crows followed tractors ploughing the fields. Hundreds of crows on the ground were feeding on every kind of food exposed by the plough. "The feeding birds never were disturbed by the farmer, who usually regarded them with favor because of the good work the crows were doing" 975. In southern **Ontario**, gulls fed in flocks for grubs, mice and worms in turned topsoil directly behind a tractor in the fall. I have never seen flocks of crows following the plough. Blackbirds, however, may join in on the feast of insects.

In **Illinois**, one crow's gizzard held 80 larvae of a broad ground beetle, *Pasimachus* species. Spiders, chiefly wolf spiders, were routinely fed to nestlings 909. In Pope County **Illinois**, during an eruption of caterpillars in the springs of 1980 and 1981, crows fed on them at the tops of trees 955. In the early spring, crows in **Kansas** protected the wheat crop by eating large numbers of cutworms and grubs a14.

Small invertebrates can exhibit dramatic population fluctuations. In particular, grasshoppers disturb the landscape of **California** once in a while. In the late 1930s, an estimated loss to the

grasshoppers was one million dollars each year in sections of this Pacific state. At least 16 species of birds reacted to the grasshoppers. In particular, six species played a primary role in reducing the number of 'hoppers. The American Crow and Yellow-billed Magpie, common birds in the area, were among the elite six. One crow's gizzard held 66 of the insects, and bands of crows fed on the grasshoppers' egg beds to extended the quiescent period between the big shows n08.

Elsewhere, the Hornworm fed on tobacco plants. In **North Carolina**, throughout one growing season, a family of three crows worked a tobacco field. No larvae reached the pre-pupal stage and chemicals were not used for insect control. Yet the grower was pleased with the yield 47s. The crows lived to add their healing touch to next year's crop of tobacco.

The innate fondness crows have for invertebrates was revealed in an experiment by Norman Criddle in the 1920s. For his 4 juvenile crows in **Manitoba** he gathered 552 cutworms. The hungry four devoured them in five hours. Next day the crows ate 121 white grubs. The average amount eaten by all four was 737 grams, or about 92 grams each day over the two days 40c. Since a juvenile crow weighed from 400–500 grams, the





The arrival of winter's ice and snow makes food harder to come by, especially when one lives on the street like an American Crow

92 grams eaten was about 20% of their weight. Considering the 4 juveniles didn't have to hunt for their food, but had it given to them in almost unlimited amounts over two days, this percentage is probably high for a crow hunting for food on its own. In comparison, in 1907, Forbush kept track of the amount of food eaten by captive crows. Adult crows needed 283–354 grams of food a day to maintain their own weight^{f55}. The 354 grams would be 71% of the weight of a 500 g crow. [This seemed like a lot of food to find and swallow each day for a wild crow, so I checked the web and birds usually ate 10–20% of their weight in a day, which for a 500 gram adult crow would be 50–100 grams, a reasonable figure.]

From Parmalee's experiments with 4 nestling crows averaging about 300 grams, they ate an average of about 17% of their weight per day^{p10}. Another study found the weight of 75 full gizzards of crows averaged 37 grams. The food inside the full gizzards averaged 11 grams^{h92}. For an adult crow to eat 283 grams of food each day (the lowest level according to Forbush above) would require 26 full gizzards. Eating this much food, or more each day, would not leave time for crows to enjoy their multi-faceted lives – loafing, playing, bathing, and discussing human researchers

they have tricked. I think Forbush, who probably didn't like crows, got a little carried away with his numbers and made a deliberate error on the fashionable side of mythology concerning the eating habits of the American Crow. Crows are normal eaters.

To gain insight on the eating habits of American Crows, a feeding experiment was devised for five crows in a laboratory. The crows weighed from 330–525 grams. Four types of food were provided to birds trained to key-peck – pigeon pellets, mixed grains, Niblets whole kernel corn, and mealworms. Mealworms were the only food



An impatient evening sky with crows

that was alive and moved. Controlled feeding sessions kept the crows at 83% of their weights. Feeding sessions lasted 30 minutes, but most crows gave up eating before the 30 minutes was over. Some foods were released in larger quantities than others, per 3 second presentation. For example, crows were rewarded with only 0.08 grams of Gaines Prime pellets versus 0.25 grams of corn niblets. Usually the heaviest crow ate the most in a session, and the lightest crow the least. The lightest crow was the only one not to eat corn (How is that possible?). Live mealworms were the preferred food at 26 grams per session, followed by corn at 21 grams per session. Mixed grain was





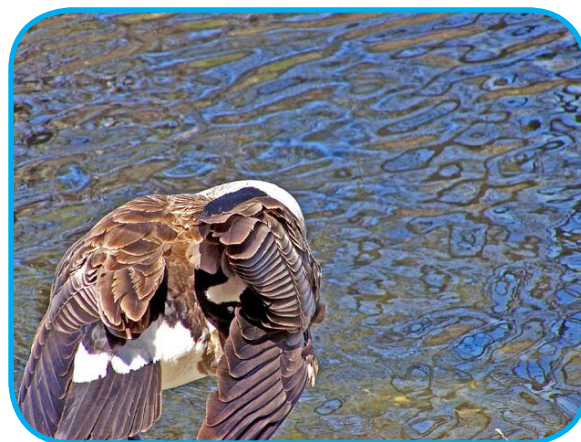
the least preferred at 6 grams per session. The experiments reinforced the omnivorous mannerisms of the crow's feeding habits, and revealed individual preferences (likes and dislikes) for certain foods p90.

Ordinarily, crows are ground feeders. But south of **Lake Ontario**, crows were engaged in aerial maneuvers. About 250 crows fed on an evening swarm of damaging European Chafer^{c48}. Returning to earth, on 22 July 1981, I stopped to look at a dead juvenile crow along the side of a road in Perth County **Ontario**. Its gizzard contained about 100 larvae from the Blow Fly family – Calliphoridae.

There is a short account by one Mr Horsfall who hastily killed crows in his corn field before he examined their gizzards to see what they were actually eating. After a closer look, he realized the crows were eating cutworms, thereby saving his crop of corn. He immediately stopped killing crows. Since that experience, Mr. Horsfall became a staunch Democrat and friend of the crow g75. In Martha's Vineyard **Massachusetts**, Gardner Hammond, a sheep farmer, thought crows were killing dozens of his newly born lambs. He offered a bounty of 50¢ for a dead crow. Then white grubs, which the crows actually fed upon, ate the roots of the grass and killed his pasture. Then Hammond stopped killing crows and his pasture slowly recovered f56. Crows also devour Gypsy Moths *Porthetria* [= *Lymantria*] *dispar* 12s.

One August morning in Guelph **Ontario**, a juvenile crow fed with three family members on a lawn. Swiftly from the juvenile's left side, at eye level, a large flying insect was approaching. The young crow ran several steps forward and with a flawless motion intercepted the insect with its bill. This ability is explained by the flicker-fusion frequency of a bird's eye 10w. Twenty-four frames per second (fps) flickering on the screen of life is close to the level of perception we have of motion. At 32 fps or faster, a slow motion effect is achieved. Birds such as swallows and swifts that feed on flying insects have a flicker-fusion frequency (FFF) 4–5 times ours, perhaps as high as 100 Hertz. In comparison to ours, theirs is a slow motion world.

Smart as a crow is, quite likely it does not understand the economics of our agriculture. It



Canada Goose preening under its wing in spring

does not know if an insect is beneficial to us. If bugs are abundant and edible, the crow eats them. Occasionally, some beneficial insects are bound to be eaten. Two such insects were found in regurgitated pellets from crows in **Manitoba** – a predacious beetle, and an ichneumon parasite of the Bertha Armyworm. A colorful observation was that the red and black turnip beetle, an abundant pest of the rape plant, was not touched by crows t85. Elsewhere, a crow was put-off by the strident noise made by the Patent-leather Beetle, *Odontotaenius disjunctus*, which kept the crow from eating it 0b7.

Crows in southwestern **Ontario** contribute mightily to the reduction of European Corn Bor-



An evening assembly of American Crows in Chatham **Ontario** on 8 December 2011





Larva of a European Corn Borer in a corn stalk. Crows eat this larvae by the thousands over the winter, © Clemson University – USDA Cooperative Extension Slide Series, 1234158 online

ers, *Ostrinia nubilalis*, over the winter. Corn borer larvae feed on the stalk, leaves and ears of corn, *Zea mays*, and is one of the most destructive insect pest of corn worldwide. Common Grackles, European Starlings and Red-winged Blackbirds feed on the larva during the warm months. In the 1980s, American Crows were observed removing fifth-instar larvae overwintering inside the base of harvested cornstalks at the Agriculture Canada Research Station in Harrow **Ontario**, about 26 km from the large Essex crow roost. In general 50% of the larvae in corn stalks were removed and eaten over the entire winter at the station. When cornfields less than 2 km from the roost were sampled, over 85% of the stalks showed perforations by feeding crows. Since the number of perforations per stalk was positively correlated to the number of tunnels by larvae, it appeared the crows sensed the number of larvae available in the stalk of each plant. Finally, 18 crows that fed in winter cornfields 10–25 km from the roost were shot from December–February. Inside their gizzards an average of 4 corn borer larvae were present in 17 of the 18 birds. Also found in the

18 gizzards were fish, unidentified meat, garbage and waste corn kernels ^{q05}. With about 100,000 crows at the roost, they provided a lot of free, unappreciated and unnoticed biological control for the farming community.

Lately however, a few whiners in the growing town of Essex got their way. Complaints about the crows forced the politicians into action to keep the home owners (tax payers) happy and safe from the crows. By 2010 the birds had been driven from their large annual winter roost in Essex County **Ontario**. The crows apparently joined the large roost in Chatham **Ontario**, a few hours away in the adjacent Kent County. It will be interesting to know if the corn farmers in Essex County now enjoy a lower yield of corn, or have to spend more money on insecticides to control the millions of corn borer larvae the crows were eating. Political interference with a natural process usually contributes to the side of stupidity.

Researchers in **Illinois** in the early 1920s tried to find a local native insect to parasitize the corn borer, without success. Imported insects from **France** were bred and released in the state. As well, a general parasite of insect eggs, *Trichogramma minutum*, an effective parasite of the corn borer, was summoned to do its job ^{f45}. Without a close look at the birds in Illinois, they had no inkling of the crow's ability to harvest borer larvae from corn stalks during the winter.

American Crows eat earthworms as soon as the ground thaws and continue to eat them over the summer. Anyone watching crows in a city would soon notice them pulling earthworms from a lawn ^{m85}. In the 1980s, an instance of selec-



Sometimes a crow will pull a large earthworm from a lawn and tear off 4–5 cm of the head region and leave the rest. These two remains were not cached or fed to its nearby mate





tive feeding by crows came to my attention on 7 March in Guelph **Ontario**. On this warm spring day, a crow pulled a large earthworm from a thawing, water-saturated lawn^{r24}. Standing on the worm, the crow tore off about 3 cm from the head region, which it then swallowed. This happened twice. The bulk of the each worm was left on the lawn with no attempt to store it. Twenty-four years later, on 7 April in **Winnipeg**, I watched a breeding crow pull two large night crawlers from a recently thawed lawn. As before, the crow stood on each worm, tore off the head region, probably the most nutritious part, ate it, then left the remains behind with no attempt to cover it, or offer the meat to its mate gathering nest material 8 m away. I don't recall seeing crows leave part of an earthworm behind in the summer months. But when talking to my dentist in early June, he



recently observed a crow on a lawn. It pulled an earthworm from the ground, then stood on it and tore off part. The crow ate the small part, then walked away from the remains. Much earlier, in 1905, a crow's crop was found to be filled with earthworms^{e20}, and F Kennard on 15 July 1923, watched a young crow gathering earthworms from his lawn for over an hour^{g75}.

Miscellaneous foods

American Crows are opportunistic feeders. At a turtle's nest, a newly emerged 2 cm long hatchling snapping turtle was introduced to a crow. The turtle was picked up, carried aloft, and dropped onto a hard surface to split its shell before the crow



Red-sided Garter Snake, November 2010 at Steeprock **Manitoba**, © Sharon Werenich, chickadeephotoart.com – with permission

could eat it^{w08}. Early in the 1920s, when many farms had free-ranging chickens, crows often took a sample of young chickens^{63m}.

A plague of grasshoppers, a deposit of mice, or a pile of snakes – all are attractive to a foraging crow. Under a **Manitoba** May sky, tens of thousands of Red-sided Garter Snakes emerge from limestone sinks, their winter home. To greet them and eat them are the local nesting crows. The crows performed a precise bit of surgery on each snake. A four cm long section of skin and muscle was opened, the liver removed and eaten^{a13}. How many of my readers know where the liver in a snake is located? I don't. Other researchers visited the snake dens during the springtime in **Manitoba**. Of 1,033 dead or dying snakes located, 57% had severe lacerations, in most cases due to American Crows removing the livers. Small snakes were carried towards a crow's nest in a tree 25 m from the reptile's den. Four eggs were in the nest cup. Within a 10 m circle on the ground below the nest-tree, the remains of 24 partially eaten snakes were found. The crows took the snakes of both sexes (females are generally larger) in about the same ratio as living snakes (about 75% were males)^{s71}.

American Crows sometimes feed on toxic Boreal Toads, *Bufo boreas*, by opening them up





from below, which helps the crow avoid toxins a07. Near Boise **Idaho**, an adult Northwestern Toad, *Bufo boreas*, was caught near a pond's edge by a crow. After pecking it to death, the crow flipped it over and pecked a hole in its belly, ate the viscera and muscle, and left the carcass with its egg mass intact 85b.

In northern **Wisconsin**, American Crows, along with 6 other bird species, fed on the ripe red berries of Red Elderberry, *Sambucus pubens*. One researcher noted, "sugar content of the pulp (but not fruit size) also significantly affected rates of fruit removal" d34. In western **Washington**, Rathbun noted the fondness of crows for Pacific Coast Red Elderberry, *Sambucus callicarpa*. He shot a feeding crow. Its gullet and stomach were packed with the red berries. Its digestive tract was stained a dark red, indicating the crow had been feeding on the ripe fruit for a while 975.

Edward Reimann watched crows wintering near Philadelphia **Pennsylvania**. "They can be seen congregated in immense flocks feeding on the seeds of arrow-arum (*Peltandra virginica*). When the rivers are full of drift ice, crows seem to take a particular delight in perching on the cakes and traveling up and down stream with the tide. On some occasions crows were seen to be eating fish frozen in the ice" 975.

Kilham decided it was a crow's curiosity and investigative nature that allowed it to discover and utilize all possible sources of food, including River Otter dung. Whenever crows saw an otter take a shit, they flew to the site after the otter left and started eating the small, mushy scats. On 9 occasions, the shit was stored 3–7 m away in a grassy clump, once under dry cow shit, and once in a

tree. The otter's shit consisted of sharp pieces of Crayfish, *Procambarus* sp, exoskeleton, which might be more useful as grinding material in the gizzard than as a nutritious snack k46.

At Nobis Slough in Scott County **Iowa**, American Crows waded in 8–10 cm of water on mud-covered flats. They grabbed crayfish, *Cambarus* sp, tossed them up on dry land, then started pecking at the exoskeleton until the inner soft parts were exposed, which

they ate. Common Grackles also ate crayfish in a similar manner 09h. In a **Nebraska** swamp near Sioux City, a few crows that nested in the nearby trees flew to the shore daily in July 1913 to feed on frogs 901. In the 1920s, flocks of crows (about



Boreal Toad, © Pierre Fidenci, with permission

200) in the Gaspé County of **Quebec**, descended to the beaches in July and fed on discarded leftovers from Atlantic Cod behind a processing plant. Crows were absent in the county over the winter d33.

In Highlands County **Florida**, American Crows nesting in the area took eel-like Salamanders, up to about 30 cm long, from both Great Egrets and White Ibises that captured their prey in a flooded ditch. The crows would chase the larger birds until they dropped a salamander. Or a crow distracted a long-legged wader for a moment, which allowed another crow to grab the prey and fly off. One crow waded in water up to its belly to seize its prey. One salamander was torn up and fed to an





Purpleleaf Sand Cherry, with 8 mm wide fruit that four American Crows ate on 9 August 2012 in Winnipeg **Manitoba**

incubating female crow on her nest 84e.

In **Milwaukee**, two birders were watching three crows feeding in Lake Park. The attention paid to two crows on the lawn increased when each crow made a vertical leap about 1 m into a Norway Maple and clung to a branch, one by its bill, the other upside down by its feet. After 20 minutes, the observers walked to the maple and scared the crows away. The crows were feeding on the seeds in winged samaras. The crows hung on the fruit with their bills as they tried to remove a cluster using their weight. When upside down, the crows removed the samaras with their bills, let them fall to the lawn, then ate the seeds 73s.

On 9 August 2012 near the main library in Winnipeg **Manitoba**, I watched a family of 4 unmarked crows (1 block from their successful nest) land in the top of a 2-story high planted Purpleleaf Sand Cherry, *Prunus x cistena*. They fed for a few minutes on the ripe, dark 8 mm wide berries. I was probably the only one watching the crows.

About Carrion Crows in **Europe** "His continual persistent search for food, and what can only be called inventiveness in finding it, makes him an ideal hero for the Searching Image story." After only a few

experiences with a new type of prey, crows quickly developed a searching image and one which was quite specific. Crows learned the prey's characteristic habitat and visited certain habitats to find certain kinds of prey. Crows did not continue to search for one particular type of prey indefinitely. They switched to another kind of prey as the opportunity for reward increased. This searching pattern and attitude of the Carrion Crow was most efficient when its prey was in a small area and of singular form and color 51c.

Carrion Crows cannibalise the eggs and young from nests of other Carrion Crows. From **Illinois** came the only published report of an American Crow that ate the eggs in another crow's nest e13.

In **Connecticut** there was some aggression between an American Crow, *Corvus brachyrhynchos*, and a Mallard, *Anas platyrhynchos*, over the reddish juicy berries of Spreading Oleaster, *Eleagnus unbellata* c81.



One driver of the shuttle to my hotel in Las Vegas called them crows. In fact, Great-tailed Grackles, *Quiscalus mexicanus*, not American Crows, visited this fountain each day during my stay in Vegas. My trip was to search for the elusive crow in the southwest USA by travelling through Utah, Nevada and Arizona





Rose hips in autumn

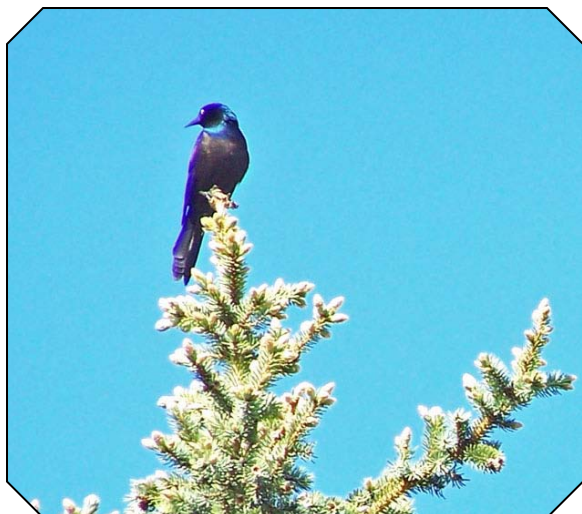
Crows or grackles?

The possibility exists, in the late 1800s to early 1900s, that reports of crows wiping out hectares of sprouting corn in May, when the birds were widely dispersed for nesting, could have been, at least in part, the work of grackles. In the late 1800s, the common name of the grackle, *Quiscalus pureus*, (now *Quiscalus quiscula*) was the Common Crow Blackbird. The grackle is a dark bird, about 30 cm in length, which is fond of corn. The grackle could have easily been misidentified as a crow, or simply called a crow by using only one part of its lengthy 3-part common name. This may have generated the “false” reputation of the American Crow as a lover of corn and enemy of the corn-growing farmer. The larger Great-tailed Grackle, *Quiscalus mexicanus* (38–46 cm long), in the late 1800s was commonly called the Crow

Blackbird. In areas of Mexico, it was often called cuervo [raven], although it is not a member of the Corvidae family [wiki]. Its early name was *C* [*Corvus*] *mexicanus* by J. F. Gmelin, 1788 – the Internet Bird Collection, IBC (online). Again, it too could have easily been called a crow by the local farmers.

Even today, some people have a difficult time identifying the American Crow. At **Pennsylvania** State University, Dr Margaret Brittingham, a wildlife specialist, and others are researching crows and their roosting habits in winter. From an online report – “All black birds aren’t crows and all crows aren’t problems” noted Brittingham. “Once people started thinking about the crow issue, then anything black and in a flock gets labeled a crow,” adds Luke Groff. “People will call and say ‘I’ve got crows in my yard!’ and it often turns out to be starlings.”





A Common Grackle (length 32 cm) is smaller and not a member of the Corvidae. The yellowish eye of the adults (both sexes) differs from the dark brown eye of the American Crow

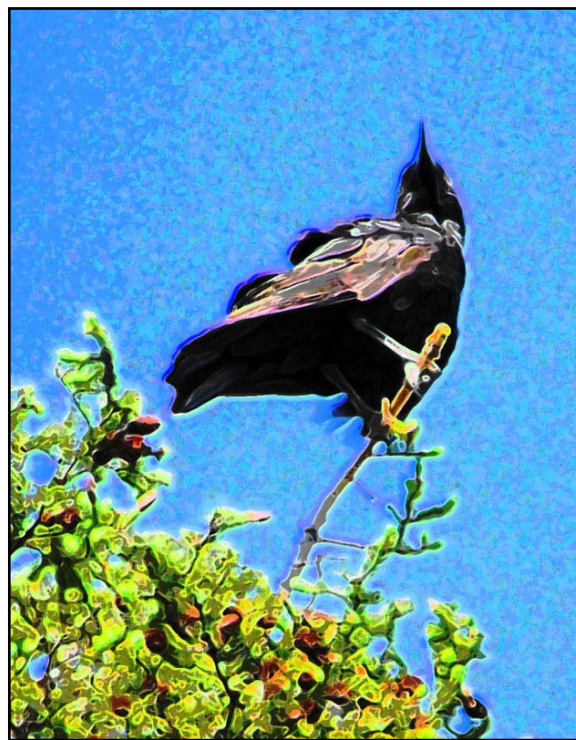
Over in Puget Sound **Washington**, a birder along the beaches described the appearance of Northwestern Crows relative to the American Crow. “They are also very appreciably smaller, indeed the first one I ever saw came near being noted down as a Purple [Common] Grackle (*Quisclaus quiscula*) that had wandered a few thousand miles from home” 47b.

In November 2011, I travelled to Las Vegas **Nevada** while visiting the southwestern USA for the first time to look for crows. As I got out of the shuttle from the airport at the hotel, the driver, who I had been talking to about my interest in crows, mentioned that a crow was drinking from a nearby fountain. I turned and looked, but what I saw was a Great-tailed Grackle, which the driver had misidentified. A group of several Great-tails visited the fountain each day to bath and drink from a continuous stream of cool water in the desert. Their sharp calls were new to me.

Like the American Crow, Common Grackles begin nest-building in the latter part of March and may nest in isolated trees (often conifers near water) or in loose colonies of 5–20 nests. Over its substantial range, it frequently consumes corn, and can saw into acorns with a ridge on its bill before cracking the fruit open with its bill (Birds of North America online). I suggest the grackle could easily pull up sprouting corn, if that is possible

for any bird, or peel back the tops of drying husks to feed on milky kernels at the tip of a cob in the summer. With some people calling it a crow, this easily led to the iconic image of crows feeding mightily on corn, in the minds of so many people to this day.

Common Grackles, in addition to eating corn, may kill and feed greedily on our beautiful song-birds. Beware, a dark and disturbing example follows. In Toronto **Ontario** a small parkette 36 x 30 meters existed between tall, very efficient, office towers. The Toronto Ornithological Club was monitoring Neotropical migrants in the city. Some were attracted to this parkette. Anne Davidson visited the parkette from 1 May – 2 June 1992 for a total of 80 hours. On 11 May a grackle with a band on its left leg arrived. An hour later it began killing smaller passerines. By 22 May, although some trees and shrubs provided cover, this one grackle managed to kill and eat 39 small passerines – Ruby-crowned Kinglets, Ovenbirds, White-throated Sparrows, and House Sparrows. The grackle changed its hunting tactics as its prey changed their hiding patterns. The grackle



American Crow in a typical perch at the top of a deciduous tree





With a throat full of shelled peanuts, an American Crow moves to a cache site in lawn 60 m away

caught birds and carried them in its claws or bill to shrubs where they were eaten. When Davidson placed raw hotdog and hamburger meat on dead birds not immediately eaten, the grackle removed its kill and fed on it at another location, ignoring the processed meat. The grackle was able to accomplish its killing due to the placement of the buildings and flora in the artificial setting which concentrated the songbirds and made it difficult for them to escape the grackle^{d14}. The parkette was probably created for office workers to enjoy a little “fresh air” during their lunch break in summer. At the same time it turned out to be a killing field for the grackle. Our culture and architecture are to blame for the loss of these songbirds; not the hungry grackle. If this grackle was misidentified as a crow by some of the office workers, you realize how easily the reputation of a crow can be altered.

In a letter from HR Buck in Wethersfield **Connecticut**, he described how, in the late 1800s, the farmers coated corn, prior to planting, with North

Carolina tar diluted in water, to give a bitter flavor to the kernels. The crows did not pull up and eat the sprouting kernels after they were coated.

Buck continues, “When it [corn] is in the milky state, they [crows] tear the husks and eat off the kernels at the tips of the ears. The harm done in this way is not great; the Purple Grackles, Red-winged Blackbirds and English Sparrows doing vastly more damage than the Crows”^{2b4}.

Four main species of birds – Red-winged Blackbirds, Brown-headed Cowbirds, Common and Great-tailed Grackles formed roosts of from 1–25 million birds in **Louisiana**. The surrounding fields were planted in rice. In the Vermilion Parish, about 50% of the farmers surveyed had suffered losses of sprouting rice to blackbirds. It ranged from 5% of farmers reporting no losses, to 3% estimating over a 30% loss of their rice crop. Rice was planted by aerial water-seeding or dry-seeding (broadcast or drilled) from late February to late April. Blackbirds fed in rice fields located up to 60 km from their roost. Theoretically, the





birds could have an impact on 5,650 km² of available farmland near the roost. Migrant blackbirds began moving north from southern roosts in mid-February to early March. There was a matching decline in the total number of flocking blackbirds per survey route, and with an increased distance from the Millers Lake roost. It was suggested farmers delay planting rice until 24 March, a time when the number of blackbirds at the roost was rapidly declining as migration took hold 0b4.

With roosting American Crows, the same general pattern is followed in the spring. Birds over the winter feed on grain left behind in fields after the harvest. By the time the new crops are planted, crows at the local roosts have dispersed and pairs of breeding crows are widely scattered over the farming landscape. They are no threat to the farmer's newly planted crops.

In King and Snohomish Counties of **Washington** state, American Crows were studied in habitats of various sizes (scales) in 2003–'04. The crows habituated altered landscapes containing a lot of human garbage (food). Crows were often observed in grass and shrub cover in urban areas, rather than in forests and on bare soil. Radio-tagged crows used the resources rather evenly in their 18 ha urban territories. Since the vegetation was usually maintained, hence sustainable over a blackshirt's lifetime, crows found certain parts of a city well suited to their contemporary lifestyle 21w.

Decades earlier, crows wintering in the **Great Basin** of the southwestern USA fed in fields and orchards, but were concentrated around garbage

dumps and livestock feeding yards. Other crows, as now, flew into cities for an alfresco brunch at diners and the now defunct drive-in movie r53.

In spite of *their* unproclaimed lust for corn, crows in central **Nevada** live amidst desert scrub in rangeland, kilometers from row crops.



A Common Grackle feeds on corn and songbirds and can easily be mistaken for a crow, or called a crow

But even the wild flowers,
If they would only come would be
Enough to make me happier.

– Ou Yang Hsiu r47



American Crows are attracted to places where humans eat, linger, and litter. A windy day in the park





Mammals as food

As earlier pellet composition studies have shown small mammals – mice, voles, and shrews, are eagerly eaten by the larger corvids. A few direct observations are available. Let us begin with white laboratory mice. Alive and well, 100 were set free on an open hill. Expecting to film hawks in action, two eager men waited in an **Illinois** dawn. Slowly the white mice explored the knoll, adjusting to their lateral freedom. Then three crows arrived. Within moments they “seized, shook, tossed and nibbled on,” the mice, then carried them away in their bills. Each dead mouse was stored in grass, up to 100 m away. For 127 minutes the triad worked silently and systematically, storing 79 of the 100 mice before a severe February storm ended the spectacle 9¹⁴.

North of Port Arthur **Ontario**, a crow rose from the roadside weeds holding a live wriggling vole in its feet. The bird bent its head often to check on its prey 9^{9b}. Even in the late 1800s, mice were known to be a favorite food of the crow.

Crows in captivity evince the greatest relish for mice; in fact it is doubtful if any other article of food is so attractive. Even newly caged Crows, which refuse to eat other food of any kind while watched, laid aside all fear when a mouse was shown them, and would crowd up to the bars and even take a mouse from my fingers, pecking savagely at each other in their eagerness to secure sole possession of the coveted tidbit. This experiment was repeated many times and with different Crows. It seemed impossible to gorge a Crow to such an extent that he would refuse a mouse. When a single mouse was given to several Crows the fortunate one that secured it was compelled to swallow it whole in order to prevent the others from seizing it, but he invariably disgorged it later and pulled it to pieces. Subsequently the hair, teeth and some of the bones were disgorged as a pellet b³⁸.

Robert R Scorso in Afton **New Jersey**, investigated the stomachs (gizzards) of 4 older nestling crows in one nest on 30 April 1892. All contained bones of mice, along with an assortment of grain, weed seed, insects, worms and barnyard refuse. From another nest, two nestlings 1 day old had



Yellow-rumped Warblers nest in the Boreal Forest; safe from crows but not logging or fires



Small mammals are a favorite food of crows

only white grubs in their gizzards. Five nestlings about 6 days old, held earthworms, beetles and one piece of corn in their gizzards 2b⁴.

In an email on 4 May 2009, Kevin McGowan mentioned crows eating dozens of Short-tailed Shrews, *Blarina brevicauda*, and small snakes. He felt predation on birds' nests was rare.

An American Crow captured a flying Little Brown Bat, *Myotis lucifugus*, in **Minnesota**. After the bat was knocked to the ground, it was eaten in a tree h⁸⁶. This was another instance of the crow's fondness for small mammals.





Short-tailed Shrew, *Blarina brevicauda*, has a total length of 11–14 cm, of which 2–3 cm is tail. It weighs 15–30 grams and is one of many small mammals eaten by American Crows. Photograph © by Gilles Gonthier. 2006, Rivière-du-Loup, Quebec, with permission

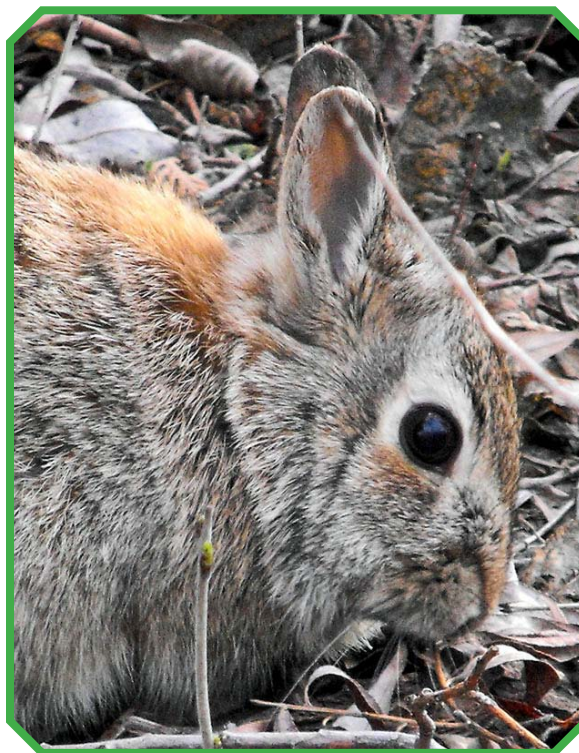
In the vernal months, food studies on the American Crow sometimes revealed Cottontail Rabbits in their diet. There were several cases of crow predation on poorly concealed rabbits' nests in the spring. The squealing of young rabbits in their nest probably helped to attract predators. Even with a parent about, the loss of offspring was inevitable when 1–3 crows were hunting ^{k73}. And yet, another study of 91 Cottontail nests in Pennsylvania revealed no avian predators ^{07b}. During the winter Mr GE Stilwell, a hunter in **Kansas**, watched five crows take on a rabbit in a contest lasting 30 minutes. The crows exhibited fine teamwork by repeatedly forcing the rabbit out from under its stone hiding place, and eventually pecking it to death ^{b38}. On 8 April 2004, at about 5 pm in Springfield **Missouri**, an American Crow began killing and caching 10 cm long Cottontail Rabbit kits. The lone crow removed all five kits from a grassy nest and cached them individually within, and out of the observer's sight. Some of the kits were removed and re-cached in a different spot and some were eaten by the morning of the next day ^{s67}. A photographer in **Winnipeg** told me crows near his home watched house cats locate rabbit nests. Once the cats had left, the crows stepped in and flew off with the remaining kits in their bills. Humans helping crows.

An American Crow captured an adult Eastern Chipmunk (about 100 grams). Holding the chipmunk in its bill, the crow shook the small mammal by its neck until it died. Flying to a tree, the crow devoured the chipmunk in 7 minutes ⁿ³¹.

In **South Carolina**, rodent carcasses (n 300)

were randomly placed in two types of unmanaged forest types. Mice weighed about 20 g and rats about 230 grams. Placement points were only used once from December through November. Photographs recorded the visits of vertebrates to the carcasses. In warm weather trials, arthropods (insects, etc) and bacteria decomposed the mice and rats not removed by vertebrates. A mouse carcass would decompose in one day. Overall, 35% of the 300 carcasses were removed by vertebrate scavengers. In warm weather, vertebrates removed only 19% of

the small mammals. American Crows had their portraits taken 3 times and always with a rat. Raccoons (30%) and Virginia Opossum (28%) were the main scroungers at the carcasses. Scavengers removed 45 mice and 59 rats within a mean of 2.6 (0.9–3.1) days depending on the temperature ^{d39}.



Cottontail Rabbit in an urban setting





As soon as we build a new fence around American Crows, they quickly learn to fly higher

For our blue black feathers
 Splendid frolicking
 Sometimes they imitate James cagney or Edward
 g robinson
 But that's just melodrama
 Stage play
 They'll twist your nose if you come too close
 Then pop they are gone
 Leaving a crow's version of a Cheshire smile

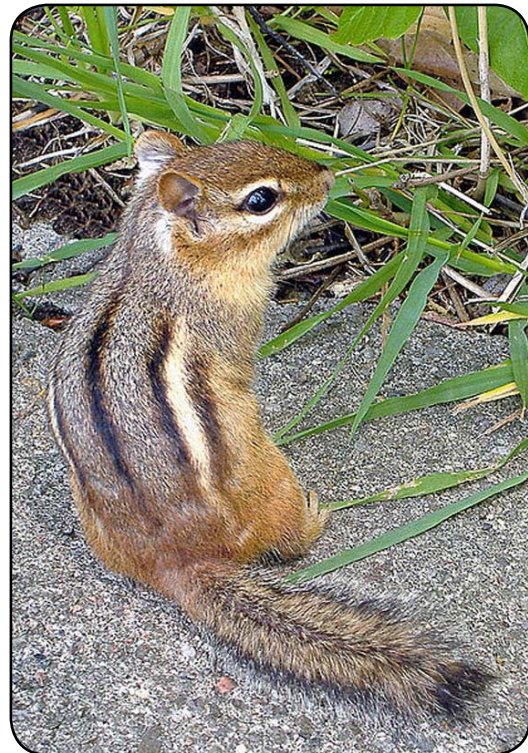
– David Scott 2010

Which scavengers fed at White-tailed Deer carcasses and gut piles in Dane and Iowa Counties in south-central **Wisconsin**? Perhaps the transmission of Chronic Wasting Disease (CWD) from dead deer to scavengers might occur. Four-

In **Kansas**, American Crows and Red-tailed Hawks arrived once dead rabbits or other mammals were placed 28 times over several years during the winter along gravel roads in an agricultural landscape. Crows took 20–40 minutes to locate a carcass and the hawks arrived a little later. A large flock of crows (20–100+) won 12 confrontations with a hawk and lost none. A group of 4–6 crows lost 4 confrontations and won one. The hawks usually mantled while feeding on a carcass. One crow approached a feeding hawk from behind and pecked at its tail. When a vehicle passed and flushed the birds, the crows were the first to return to a carcass to feed, usually within 20 seconds. If a flying hawk dropped a carcass, the crows quickly took over the body. 119.

CROWS

Don't exist
 Except negatively
 Black holes they are
 Reaching occasionally from the other side
 For a corpse or a lamb's eye
 Little to ask they say



Eastern Chipmunks (60–120 g) are rarely eaten by crows, High Park, Toronto **Ontario**
 © Paul B Toman, with permission





Gulls are the most common avian competitor of the American Crow. Ring-bills use artificial perching sites in the city and eat many of the same natural and discarded foods as crows

teen mammals and 14 birds were photographed at dead deer. American Crows, raccoons and opossums were the top 3 scavengers. Others were Red-tailed Hawks and Turkey Vultures. Domestic dogs and cats also visited the deer. A precautionary testing for CWD in some of the scavengers might be fruitful j21.

In Jackson Hole **Wyoming**, Common Ravens flew toward the sound of gunfire (rifles) expecting to feast on gut piles left by hunters after they killed a large mammal. Even more remarkable, ravens only responded to gunfire in forested habitat w72.

Every now and then, crows rub sheep herders the wrong way. In **Australia**, immature crows and ravens formed small flocks before they settled on a territory to breed. At lambing time, these corvids dined on the afterbirths and carrion. Sick lambs and adults were finished off by these strong, persistent birds. Rarely do healthy sheep succumb to attacks. With ravens removed by whatever means (ie. poison), this could result in an outbreak of fly-strike, because the flies would have more carrion on which to breed. This would lead to more stock losses than those blamed on the ravens 33r.

Reports of crows injuring or killing livestock in North America have long existed. In **Florida**, L Kilham told in vivid detail of attacks by up to five American Crows on Spotted Deer fawns, *Odocoileus virginianus*, in April. As one young fawn

about 35 cm high and weak on its legs came toward him, 5 crows were constantly after it. As it ran one crow stayed on its back while the other four dove and struck it. When the fawn collapsed in the grass, the crows landed and pecked the fawn on its head, eyes and other parts. The doe seemed unconcerned, licking the rear of the fawn while the crows pecked at the front. In spite of 15 bouts by the attacking crows, Kilham, with binoculars and only 3 m away, saw no damage to the fawn as it entered a swamp. Several days earlier, Kilham's wife saw another fawn use its forelegs to repel the crows. A young Raccoon, *Procyon lotor*, under attack, was saved by its mother. A small suckling feral pig was also attacked by crows. As the piglet ran, a crow rode it for about 20 meters. The crow used its open wings for balance, while it pecked at the piglet's head.



An American White Pelican on the north shore of the Assiniboine River in **Winnipeg**. Death invites crows to a feast





Nictitating membrane covers the eye of an American Crow in a church yard

At two other feral pigs that were young and dying, Black Vultures stood nearby waiting for the end. When Kilham approached, the vultures moved away and the crows began to peck aggressively at the mammal, opening small holes from which they fed. The pigs soon died. The attacks by the crows did not seem to be related to the stage of their nesting cycle; they were simply hunting. Although the crows did not kill the animals, the birds were actively pursuing them, as if testing for a weak one ^{k52}.

In an earlier narrative, Kilham and his wife saw crows in **Florida** interact with feral hogs in a more gentle manner. The adult and young pigs, while resting on their sides in a field, were cleaned by 1–3 crows. The pigs remained in a relaxed position and appeared to invite the crows to work on them. Hog lice, by their very abundance on all feral hogs in the area, were probably the items removed by the birds. Range cattle were also deloused by crows, the longest feeding time lasting 20 minutes. The mammals did not allow crows to feed about their heads. After mid-March, the abundance of insects in pastures lured the crows from the livestock ^{k42}.

Near Boulder **Colorado**, Black-billed Magpies (48 cm long) landed on Mule Deer. They fed on the deer's ectoparasites. In the summer magpies may also take insects flying close to the deer ^{m33}. In central **Italy**, European Magpies, *Pica pica*, landed on the backs of Fallow Deer, *Dama dama*, and apparently fed on their ectoparasites. The magpies preferred to land on adult males, rather than females or calves ^{g13}.

During a study of Belding's Ground Squirrels, *Spermophilus beldingi*, Clark's Nutcrackers (31 cm long) in Mono County **California** were observed attacking several small vertebrates –

- (1) Mountain Vole *Microtus montanus*
- (2) Belding's Ground Squirrel
- (3) Pocket Gopher *Thomomys monticola*
- (4) Yosemite Toad *Bufo canorus*
- (5) White-crowned Sparrow *Zonotrichia leucophrys*

About half of the attacks resulted in death of the prey ^{68m}.

A video by a deer hunter near Lake Placid, **Florida**, showed a Florida Scrub-jay feeding on





Ring-billed Gulls and American Crows remove dropped food, dead birds and mammals, road kills, and our leftovers across this vast continent

the back (for 30 seconds) of a White-tailed Deer. The deer paid little attention to the pecking and hopping by the jay ^{f37}.

Online is a 7 minute video of a crow feeding a kitten and becoming its friend, playmate, and guardian. The video has garnered millions of visits. Search for – Crow and Kitten are Friends.

In Gettysburg Park **Pennsylvania**, a suite of 4 scavengers were attracted to the soft tissue of White-tailed Deer carcasses during two winters. Scavengers were observed for 36, three-hour periods by researchers about 75 m from the bait. Three habitats were compared – woodland, open, and edge. For all sampling periods, at least one species showed up 97% of the time; strong wind kept them away for one sampling period. The frequency of occurrence of each species –

- (1) Turkey Vultures 72%
- (2) Blue Jays 61%
- (3) **American Crows 58%**
- (4) Black Vultures 25%

American Crows were most common in the open and edge habitats and least common in the wooded habitat. With Black Vultures at the bait, crows were alone 67% (n 150) of the time. During bad weather in one sampling period, American Crows ate the remains of deer separately with each of the two vulture species.

Although Blue Jays were often the first to arrive at the bait, they took longer to start eating compared to crows and Black Vultures. American Crows were the first to eat bait during 50% of the sampling periods in which eating was observed. Frequency of eating and calling by crows varied among the habitat types. They were quite gregarious and the most vocal. Crows were in groups of at least three birds, [family] and sometimes larger groups. Often one or two crows called from within 5 m of the bait until other crows arrived. Then they began to feast ^{05r}.

In **Illinois** over the winter, a lone, tagged Golden Eagle often fed on carrion. Its only competitor was the American Crow. Crows always left the carrion when the eagle approached it ^{a58}.



Birds

In the first decade of the 1900s, Mrs Irene Wheelock listed a cross-section of food eaten by crows in **California**. She ended by writing “The fact that all feathered creatures are arrayed against him is proof to me that, from the bird-lover’s standpoint, he does more harm than good.” She presents herself as a bird-lover ^{w69}. Is the





crow not a songbird?

At the zenith of the slaughter of crows by hunters, governments, and conservationists in the 1920s, this article appeared in *The Auk*, a journal of ornithology p03 –

There is much disagreement among ‘experts’ as to methods of protecting wildlife, some preaching extermination of so called pests, others opposing such a violent upset of Nature’s balance. Personally we hold the latter view and would advocate the killing of individual birds of a species when damaging crops or wild fowl, but not the extermination of the species. The latter may involve factors that we know nothing whatever about at the moment and once accomplished can never be rectified.

In this connection we call attention to the curiously involved case of the Crow, against which widespread propaganda are now being carried on in the daily papers and some sportsmen’s journals. A recent issue of the ‘Game and Fish Conservationist’ throws much light on this subject. We read here an illustrated account giving the experiences of Dr. B. H. Warren with Crows on the Virginia coast islands where by the aid of photographs great quantities of Gull and Mudhen eggs are shown under trees where Crows nest. We know that thousands of these eggs are washed out on the meadows by high tides but to what extent these eggs furnished the Crows supply we have no data. The interesting fact however is that while this article (widely circulated) is an attack on the Crow, the bird that did this damage is quite another species, the Fish Crow, an important detail which is not referred to! Furthermore a prefatory note states that a leading gun-powder company financed Dr Warren’s trip, and that the sales manager of the company states that Crows are increasing of late years.

Most ornithologists will differ on this latter statement while the publications of the US Department of Agriculture (Biological Survey) show that the Common Crow does about as much good as harm. By all means let the farmer kill Crows when damaging crops but do not let us *exterminate* an extremely interesting species of bird on the **advice of ammunition manufacturers.**

Predation on nesting colonies

An incident which illustrates this point occurred at a heronry in Florida where human intrusion was blatant. Mr Foster’s narrative outlines the essential teamwork between man and crows b38.

In the years 1874 and 1875 a party of us made two round trips to Lake Okeechobee, **Florida**, by way of the Kissimmee River. We also took a third hunt as far as Fort Kissimmee. In these voyages it was very interesting to observe the habits of the Crow. All the herons and water turkeys (darters and snakebirds) had built in the hummock adjoining the water. Whenever our boat, the Forest and Stream, suddenly rounded a point there was a great stir in the rookeries and a lively time for the Crows. The latter birds seemed to know our movements, for they were ever on the alert at every disturbance, and began actively to plunder the nests, robbing them of both eggs and young birds. When we came to a rookery of plume birds our guns created great confusion among the herons; but the Crows seemed to take in the situation, and apparently understood our intention, for they paid no attention to the noise of our guns, but plied their work of destruction upon the eggs and young as mercilessly as did we upon the old birds. As long as



A small spruce tree in the English Garden of **Winnipeg** provides a home for nestlings of Chipping Sparrows





Two American Crows wear patagial tags and colored leg bands that identify each bird in behavioral studies. The radio antenna locate crows day or night. Copied from the web, photographer and place unknown; possible from the Ithaca, NY area

we continued shooting they made havoc among the nests.

Naturalists and sportsmen complained that a general feeding survey based on gizzard analysis did not expose the amount of birds' eggs that crows consumed. They pointed out that yolk and albumen were quickly digested and undetected in gizzard contents. And they were right.

American Crows were along the **California** coast where Least Terns bred in colonies m58. In the mid-1980s, Red Foxes and American Crows became the two main predators of the Least Tern colonies (California Least Tern Recovery Team, unpublished data online). Earlier, researchers used radio transmitters on Least Terns to track their feeding patterns. The terns proved to be an unsuitable species for this type of tagging m57. Along the way, American Crows, American Kestrels, feral cats and a Peregrine Falcon, all added to the destruction of tern nests. I am wondering how big a role the presence of the researchers had in disturbing the nesting terns which attracted the predators? Researchers rarely implicate themselves by indicating their presence might have a negative influence on the outcome of nests they repeatedly visit in the field.

In Venice Beach **California**, a colony of Least

Terns nested on the beach. The density and movements of crows in the surrounding area were studied for 2 months before the terns arrived in mid-April to begin nesting. American Crows were the main predator. Positions of crows and food subsidies were plotted on a map divided according to different land use patterns. Crows were sighted most often in developed parks where the highest amount of discarded human food existed. And crows were at the parks more often on weekends, as were the messy people. However, the crows made good use of all the various habitats around the tern colony. This would make it difficult to control the crows based solely on landscape management. The grassy areas in the parks also provided natural food (insects, worms, spiders) for the crows. The trees in the parks provided suitable cover. The parks were close to the beach where the terns nested. "The crows are well aware that more humans indicated more feeding opportunities. Where there are people, there will be crows" a59.

Dealing with the above colony of nesting Least Terns, when about 100 active tern nests were present at Venice Beach, volunteers walked through the colony searching for nests with eggs. A wooden tongue depressor was placed 50 cm north of a nest and a GPS reading was taken





d31. In my opinion all this disturbance at the tern's colony by humans checking their nests alerted the watchful, intelligent crows. The terns were in the air screaming at the volunteers near their nests. After stropping their bills, the crows took advantage of the situation to eat the eggs and young of the terns. The crows aided by the researchers kept the terns from fledging young in 7 years during the period 1999–2010. Some people doing nesting studies still don't get it.

At a colony of Least Terns on ocean beach in West Haven **Connecticut**, most of the predation came from Black-crowned Night-herons, *Nycticorax nycticorax*, and American Crows. Predation varied over the 2-year study. Overall 26% of 545 nesting attempts failed in 1987 and 62% of 606 attempts in 1988. The Night-herons arrived at night and landed in the central part of the colony. They were not mobbed by the sleepy terns as they took chicks and eggs. They accounted for 33% and 74% of nest failures. In daylight, American Crows landed at the edge of the colony and took eggs. They were mobbed by the Least Terns. This may have limited the crows' rate of predation, which amounted to 5% and 11% of nest failures, respectively. Humans caused 8% and 0% of the nest failures. Nest abandonment was 32% and 7% for the two years. 0b5.

In addition to work at the two large colonies of Least Terns above, 7 smaller colonies with 2–230 nests were also studied. Adding the two largest colonies in with the seven, and over both years, 52% of all tern nests failed. Black-crowned Night-



Fish Crows and not American Crows are common predators at heronries along the coasts. A painting of Long-legged water birds by David Scott, © 2011, with permission

herons took 43% of the nests; small mammals (mainly the domestic cat, *Felis domestica*, 16%; American Crows 5%, humans and high tides less than 3% of the nests 0b6.

Along the sandy shores of the Pacific Ocean, Carolee Caffrey studied the nesting behavior of Least Terns, *Sterna antillarum*, in **California**. In 1993 there were 2,792 breeding pair in the state. Kestrels, crows, rats, ravens and a Peregrine Falcon were the main predators. People, *Homo sapiens*, also contributed to nest losses, and people, not crows, stole equipment from the researcher's vehicle. Where crows became a problem, the placement of a few crow carcasses



Juvenile 20 days after departing its nest; a wing stretch while perched in a Cottonwood on 21 June 2011





Family of four interacting on 8 July 2011

at the nesting colony kept living crows away c10.

American and Fish Crows were considered predators of Black-crowned Night-Herons' eggs in southern **New Jersey**. Crows stole eggs only when the herons were off their nests, even momentarily 1b9. In **North Carolina**, an estimated six pair of nesting Fish Crows accounted for 32–44% of the egg losses (1983–'84) from a colony of White Ibis with about 3,700 nests. In spite of this, it was felt the level of predation could be sustained by the Ibis population s69. There were breeding colonies of White Ibises along coastal **South Carolina**. When dry weather in the spring of 1985 greatly reduced the number of active nests, Fish Crows preyed upon the many abandoned nestlings at Drum Island. The Fish Crow population was quite high, "apparently as a result of the recent establishment of a nearby garbage dump." Again, changes in the landscape by people altered the concentration of some birds to the detriment of other birds 11b.

Shortly after I began working as a waterfowl biologist at Luther Marsh in southern **Ontario**, I was told a story by a long-time worker at the marsh. One summery day a group of birders arrived at the marsh to view a colony of nesting herons. They paddled their canoes as close as possible, perhaps to get one great picture of

large young in the nest. The next day, most of the young herons were dead in the water below their nests. The herons never nested in that location again. Birders were not allowed near any heronries at the marsh after that memorable event.

Heronries continue to give some of their avian resources over to the dark side. In Waller County **Texas**, 1,500 nests belonged to Little Blue Herons, and 3,000 nests to Snowy Egrets. The birds were concentrated into an area of less than half a hectare. Before the egg-laying period was completed, crows discovered the food and by 17 April every nest with eggs was destroyed. The same year, Black-crowned and Yellow-crowned Night-Herons also nested in a large colony, but their nests were less concentrated. Although the night-herons began nesting shortly before the Little Blue Herons and Snowy Egrets, they suffered far fewer egg losses. About 40 crows lived in the area. Perhaps the spacing of the nests had more to do with their survival when under attack by the crows b17.

A pair of American Crows knocked a low flying Cattle Egret, *Bubulcus ibis*, to the ground in late December in Okeechobee County **Florida**. The flying egret was knocked to the ground four more times in several minutes before it took refuge in a Washingtonian palm, *Washingtonia*





sp. Unable to continue their attack, the crows left and the egret flew off 5 minutes later, apparently unharmed 102.

In 1969 **Texas**, a lattice of breeding birds consisted of 181 pairs of Little Blue Herons, 10 of Anhingas, 6 of Green Herons, and 3 pairs of Common Egrets. Crows were observed harvesting the herons' eggs. No eggs survived the first nesting attempt, or the second nesting attempt. All nests were disturbed and tagged by two field workers. Crows were noticed in the vicinity and several times crows were seen robbing nests of eggs as the biologists went about their work. Crows were thought to be the major predator, although raccoon, mink and the Texas Rat Snake, *Elaphe obsoleta*, also ate some of the eggs. The two field biologist summed up their summer at the heronry with this remarkable statement. "No explanation for the total nest destruction is available although increased human activity may have been partially responsible" t20. **Really?**

The birdlife changed over a span of 60 years at Fort Sisseton in the northeastern corner of **South Dakota**. The crow was rare in 1878, but by the 1930s it was a common migrant, but not a common nester. However, a pair of breeding crows on Rush Lake fed their young from nest contents of the Black-crowned Night Herons. In June 1931, the adult crows and their two juvenile offspring were shot to eliminate the family's mur-

derous ways y20. How wonderful for the herons.

Five species of herons nested on an island at Vero Beach, Indian River County **Florida**. A total of 279 nests were tagged and the growing nestlings followed to about day 10, when they left their nests. A mirror on a pole was used to check the contents of each nest. Brown Pelicans nested among the herons' nests. When the pelicans landed, they sometimes dislodged eggs or nestlings from the herons' nests. About 50 Fish Crows used the island for feeding, roosting and nesting. Crows were seen pecking eggs and flying off with nestlings. An estimated 75% of the egg and nestling losses by the herons was due mainly to the pelicans and some to the Fish Crows m64.

The nesting Ring-billed and Herring Gulls took a terrible beating from American Crows along the islands in Georgian Bay **Ontario**. Ravens, a Red Fox, and lack of food may have also contributed to a total reproductive failure of some of the colonies, unlike previous studies at the same location. The purpose of the field work was to assess the breeding habits of the gulls. As usual, the biologists visited each of the 4 colonies 4 times in May and June. Counts of nests and their contents were made. Breeding success was established by counting the number of 3-week-old nestlings on the islands. Egg theft by crows was watched by the researchers 400 m from the gull colonies e59. Here again, I suggest the biologists walk-



American Crows with food on a silty river bank





Nest of an American Robin in a conifer. American Crows will *occasionally* eat the eggs or nestlings

ing around the breeding colonies and standing in them greatly disturbed the gulls. People were largely to blame for much of the predation by the troupe of wild food-gatherers in the area. Corvids and other animals are opportunistic. Where humans walk they follow, and pick up the pieces we leave behind.

Back in the 1920s along **Lake Michigan**, the banding of Herring Gulls and terns was common. On Hat Island, a party lead by Mr McCrea banded about 170 young gulls. Returning to the island a few days later, several unbanded young and several dead banded young “had evidently been killed by a small colony of crows, residing on the island. This so incensed Mr McCrea that he later employed a professional crow hunter to exterminate them on that island.” Again, all his activity of banding, including many soaked young gulls that temporarily took to the water as an escape route from him and his crew, caused the avian parents to call excessively. This prolonged banding operation alerted the local crows to an easy meal, once the uninvited ornithologists left for the day 186. Along the eastern shore of **Lake Michigan**, nesting colonies of Herring Gulls were banded and studied on several small islands in Green Bay. From a researcher’s experience, “On approaching a breeding colony of gulls a wild panic begins which does not cease so long as the intruder appears to be in the immediate vicinity” 78s. [Does anyone think a crow would not notice and investi-

gate such a noisy melee with black joy?]

A few young gulls were kept in cages 78s. When they were in their second year, a juvenile flying American Crow was placed in with the Herring Gulls.

The gulls advanced with threatening actions and even pecked the crow on the head. The young crow maintained an air of unconcern giving little attention to the gulls who ceased troubling it after a few moments. The crow became at least their equal in bluffing, and I have recently seen it drive all three of the gulls away from the food dish without a battle. The extent to which the gulls submit to the crow, however, seems to vary inversely with their hunger.

At the western tip of Long Island **New York**, where Fish and American Crows shared the earth, Fish Crows nested closer to, or within waterbird colonies since they were coastal specialists and often fed on eggs and young waterbirds. American Crows specialized in human habitations, with garbage and lawn their main feeding sites 125.

Black-crowned Night Herons, *Nycticorax nycticorax*, nest in **Maine**. Of 125 heron nests, 27 (22%) were destroyed by crows and in 1940 crows made nesting by eider ducks and Herring Gulls, *Larus argentatus*, difficult on Kent Island in the **Bay of Fundy**. Eggs and nestlings were destroyed. In one case a startled crow carried off an eider duckling in its claws to a feeding spot among spruce trees 975.

Breeding birds were enveloped in the Cap Des Rosiers, along the north coast of the Gaspé Peninsula **Québec**. Among the breeding colonies





While I'm out watching the antics of juvenile crows, a pollinator and Cottony Burdock performs its ancient ritual, 24 July 2011

of seabirds, crows and ravens put in brief appearances. "No intolerance was noted between these intruders [corvids et al] and the resident population" m27.

Savannah Sparrows, *Passerculus sandwichensis*, nested on Kent Island **New Brunswick** in the 1990s. They nested among breeding Herring Gulls, for the mobbing protection the gulls provided against the occasional crow. The sparrows apparently felt crows were a greater threat to their nesting success than were the gulls they associated with. The researchers explained that the predacious American Crows were "scarce but highly effective." In the end, the sparrows' eggs and fledglings survived as well as those of sparrows that did not nest among the gulls for protection w70. Perhaps crows were not the real enemy.

A slow digest indicated the predators of nests in the city and country were common and involved several species. Some suggested the rates of predation were generally independent of the abundance of crows, when several other predators existed. Since other predators usually exist

where we walk, targeting any one species, even the crow, has little value in saving a preferred species m50.

Predation on common birds

The Olympic Peninsula in **Washington** State was the theatre for a 4-year study from 1995-'98. Surveys and experiments were established on 49 plots in 12 landscape categories. A solid relationship between predation of 905 artificial nests of Marbled Murrelets, *Brachyramphus marmoratus*, and corvid abundance was their goal. The Gray Jay, Steller's Jay, American Crow and the Common Raven were the players. Corvid abundance was sampled using point-counts, transects, and broadcast attraction calls. It took 15 days for eggs to be predated and 81% were by avian predators. Nestlings lasted for 13 days and 87% were predated by mammals.

Between 06:00 and 07:00 am was the best time to detect American Crows. For all four corvids, the correlation between abundance and predation was weak at the plot-level, but much closer for the 12 landscape categories. Attraction calls provided the best measure of corvid abundance at the landscape level. It was difficult for the researchers to compare their study to previous ones due to differences in methodology. They suggested their point-counts worked best in the dense forests of the Pacific Northwest. At the 905 artificial nests containing eggs and nestlings, the numbers of corvids leaving signs were l81 –

- (1) Nests with eggs –
Crows / Ravens 6%
- (2) Nests with nestlings –
Crows / Ravens 2%

Regardless of the findings, rarely is remedial action taken against crows or corvids these days, especially in towns and cities. Considering that





Canada Geese in a reflective mood.
Early September, 2011 **Winnipeg**

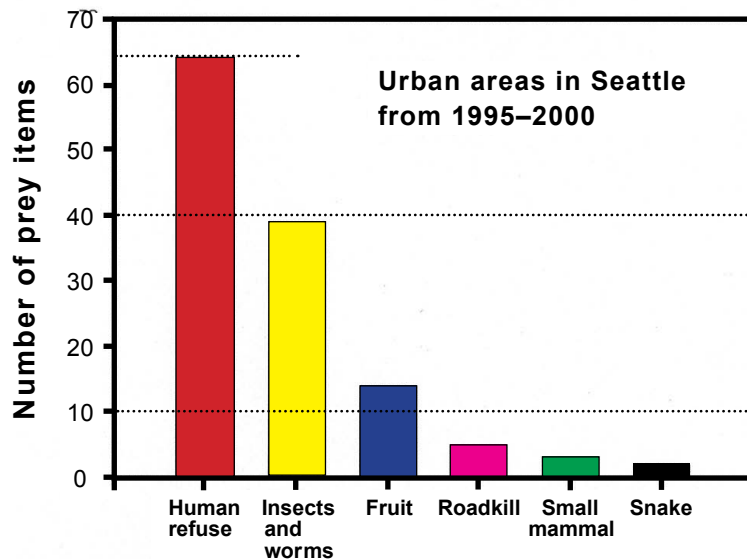
human activities are responsible for most of the decline in songbird populations and increase in corvids, it might be advisable to stop studying the traditional, so-called harmful corvids and study why crows benefit our urban landscape. Along the way, the negative attitudes of some poorly in-

formed people, including birders, hunters, naturalists, and politicians, might change.

In **Washington** state 54 American Crows were radio-tagged each year from 1995–2000. With over 1,500 hours of observation per year during the 5-year study in the Olympic Peninsula, two songbird nests were predated by the tagged crows. Within Seattle, 14 radio-tagged American Crows were watched for over 800 hours per year for two years. No nest predation by these tagged crows was observed. Several times songbirds were observed mobbing crows, but no predation was involved m50. A casual observer may report this mobbing as an instance of predation on a songbird's nest. In the late spring, when many bird species were in their nesting mode, a crow flying anywhere near them (redwings, kingbirds, etc) would be mobbed until it left the songbird's territory. The average bird watcher lives in a home, works in an office, and drives a car, all of which kill or maim hundreds of birds each year. When you add all the other bird kills from vehicles delivering goods that a birder uses in her lifetime, the total bird kill easily surpasses that from a pair of crows nesting in an elm tree in her front yard. Let's give the American Crow more credit and praise, instead of our ongoing strident abuse.

From 1998–2004 in the Seattle **Washington** metropolitan area, John Marzluff looked at the

relationships of nesting songbirds and their daytime predators in various spacial scales from 1 km², to forest remnants of 0.5–70 ha, to 50 m radius plots. Steller's Jay, *Cyanocitta stelleri*, was the greatest predator. In all habitats combined, 52% of songbirds' nests were successful, and 49% of their territories were successful. It was felt some nest predators may have influenced the fine-scale choice of habitat type used for nesting by some songbirds, but it was not an overall controlling force. Conversely, do predators choose nest sites in territories that have or may have an abundance of songbird nests? Bear in mind American Crows are early nesters compared to many



374. No songbirds, but 65% of the observed food items eaten by American Crows in Seattle was human garbage m50





songbirds. In general, “predator loads were similar at territories that fledged and did not fledge young” m55.

As is usual for a partial study like this one and many others, all the relationships could not be taken into account, ie. nocturnal predators were not studied, weather was not mentioned. Any habitat is too complex for our simple methods of study. And it is common knowledge the effect of a human's presence when studying relationships of plants and animals is rarely given. We cannot provide the results of a control study (no study) for comparison. Everywhere we go we are an unproclaimed disturbance.

Two researchers were gathering nesting information on passerines in the short-grass prairie near Swift Current **Saskatchewan**. Incidental nesting data on the Long-billed Curlew, *Numenius americanus*, were added. Several nests were found and the young banded. In one delightful field observation, two curlews were harassing an American Crow. Along the way the curlews destroyed two nests of Horned Larks. In one, 2 nestlings were eaten, in another lark's nest an egg was broken s04. However, since American Crows were in the area, they, rather than the curlews, must have been responsibly for the destruction of the 2 nests of the Horned Larks, or so the history of marauding corvids reported by humans would indicate.

During my two-year study of crows at 47 nests in Winnipeg **Manitoba**, I never heard or witnessed crows destroying another nest of a bird, nor any bird disturbing a crow's nest r28. During their decades of field studies on crows in the **United States** Carolee Caffrey and Kevin McGowan at various times indicated they have seen very few instances of American Crows robbing nests of other birds (personal communication).

In Milwaukee **Wisconsin** a crow flew past a car on 10 June 1990. After a deliberate flight, the American Crow landed in a tree, poked its head into a knot hole and with its bill pulled out an



Gulls, such as this Ring-billed, prey on waterfowl eggs and newly hatched ducklings

adult European Starling (85 grams). It shook the starling, and with the bird wildly flapping, the crow flew about 70 m to a wooded fenceline s55.

There were two instances of American Crows killing and eating Black-capped Chickadees from a bird feeder in a backyard. This was on 27 and 28 December 1995 in suburban Dane County **Wisconsin**. A crow carried a chickadee in its bill to a nearby White Ash tree where it consumed the prey. The head was swallowed in one motion and the rest of the bird took four additional motions. The next day the scenario was repeated. Thereafter, this predation was not observed again and chickadees continued to visit the feeder. It was thought these were chance encounters rather than a learned behavior for the crow w30.

On a June day in **Maine**, a Brown-headed Cowbird just out of a nest was met by an American Crow. When the crow alighted near the fledgling, the cowbird hopped towards it begging for food (an adaptive measure for this species). Initially the crow retreated, then, sensing an easy meal, killed the cowbird and flew away with it f23.

Late one March afternoon in Guelph **Ontario**, a quiet, large snow was falling. Some newly arrived Killdeer were huddled on turned soil in a field. A pair of crows were feeding nearby in





This Killdeer was decapitated by an American Crow. Later it was transformed into the crow

a weedy field. Then I noticed one crow flying low and carrying something rather large. As my binoculars came into focus, that something turned into a Killdeer being carried by its head. Crows do fight over fresh meat. The bird with the Killdeer had to keep moving to stay ahead of its mate. It landed and pulled out several bill-fulls of feathers, then picked up the carcass in its bill and flew on. I too joined the chase and managed to separate the crow from the Killdeer, which by then was decapitated. The body was still warm and limp. Though I did not view the kill, it was probably the crow, masked by the falling snow, that managed to make fatal contact with the plover.

American Crows stooped at American Robins and Killdeer in southern **Florida** k48. Near Ernfold **Saskatchewan** on 1 September, one of a pair of crows approached a small flock of swallows perched on a telephone pole and wires. The actual hit was not observed, but one swallow struggled as it was held by one foot of a crow perched on the crossbar h49.

Crows express a certain aptitude for negotiating the capture of smaller flying birds. For example, a Northwestern Crow caught a flying juvenile European Starling. Both times the crow used its feet and both times the starling escaped within seconds following contact j06. Another starling was less fortunate. This time a Carrion Crow pursued a starling and after about 45 m of dedicated flying caught it "in a flash." Clutching the starling in its toes, the crow vanished behind June greenery w28. One day a Carrion Crow pounded a lapwing out of the air with three separate pecks. The lapwing died that same day in the hands of Tinbergen, who watched the episode t54. Crows used their feet to carry two robin nestlings c54. Elsewhere, a pet crow flew off with a partially eaten cob of corn in its feet. An American Crow attacked a European Starling in flight 55c, and another crow captured a House Sparrow in flight 08p.



A sentinel crow prefers an exposed branch when perched atop a tree such as this Cottonwood

